

Contractors and Engineers Monthly

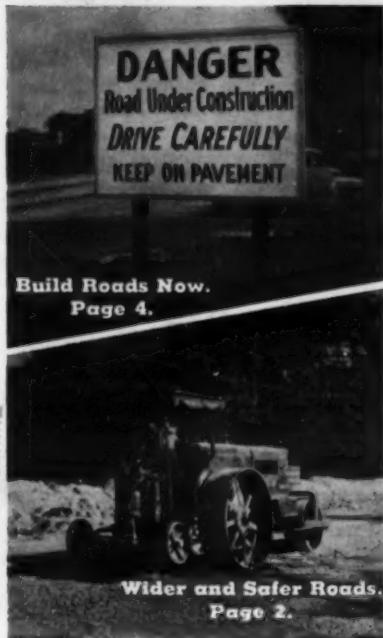
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NATIONAL DEFENSE



Highways and Airports Will Play Major Part

* IN the defense of America there are four vital factors: the navy, the air force with its necessary bases; a motorized and mechanized army; and our highways. Before the first three can go into action, highways must function in the preparations for national defense.

We in the United States have been sitting back complacently and sometimes boastfully agreeing that our highway system is the best in the world. But today it is not nearly good enough—not by some 100,000 miles of roads and more than 22,000 bridges—to meet the emergencies which this country may have to face in the not-too-distant future.

In this article we propose to discuss the contribution which can and will be made by the construction industry as a whole, and particularly by our road builders, in the defense of America.

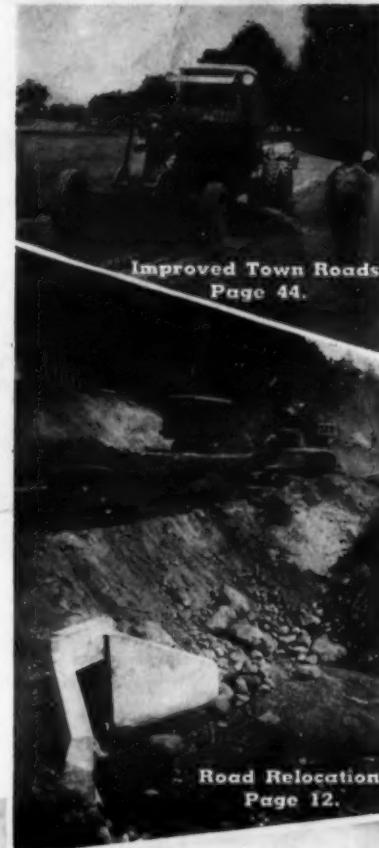
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MAR 24 1942



Roads for Defense.
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War Dept. Photo

N. A.



Equipment Production Can Meet Needs
of Road Program. Page 53.

All-Year Roads for Industry.
Page 9.

Highlights Of This Issue

• National Defense

Because of the all-important program for national defense, we have prepared for this issue a comprehensive survey of the part the construction industry is now playing and the even greater role facing it, particularly in highway and airport construction. This subject is so vast that it has been impossible to give more than a summary, which we offer in the hope that it will crystallize the present situation and throw some light on the future.

See page 1.

• County Black-Top Work

The methods of road-mix construction used by Vanderburgh County, Indiana, as well as the organization and equipment used in the maintenance of its 800 miles of county roads, are described in this issue.

See page 7.

• Snow Removal and Defense

The importance of keeping roads open to traffic all year around, in order to facilitate the defense program as well as to keep military traffic moving in an emergency, is discussed by Ernst Lieberman, Chief Engineer, Illinois Division of Highways.

See page 9.

• Road Relocation

S. Route 3 in New Hampshire was greatly improved last summer by a 4.24-mile contract for a 50 per cent relocation, many changes in grade, and a new ad-mix surface, involving a considerable amount of heavy grading in rock and ledge.

See page 12.

Airports for Defense

The Snohomish County Airport in the state of Washington, started as a county-sponsored WPA project, has assumed a new importance because of the need for more airports for national defense. Extended by the establishment of an Army Air Corps base there, this project involved a total of 2,800,000 cubic yards of excavation and the construction of four runways.

See page 15.

• Battling a Blizzard

A first-hand account of the Minnesota Highway Department's battle with the worst blizzard in the state's history, describing the activities of the state crews in rescuing stranded motorists as well as in opening the roads to traffic, appears in this issue.

See page 16.

• Modern Bridge Replaces Old One

An old truss "horse and buggy" bridge at Springfield, Vt., was recently replaced by a modern 285.66-foot two-span plate-girder structure. The project also included considerable grading and two approach fills as well as the relocation of 1,700 feet of the Springfield Terminal Railroad.

See page 29.

• Improved Township Road

The Town of Franklin, Mass., improved one of its heavily-traveled roads last summer by recontouring the old road and resurfacing it with road mix, carrying on the two operations simultaneously.

See page 44.

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W. A. Corbett

Roadside Development 1940 Award Winners

Corbett of Oklahoma Gets National Award; Central Section Award Goes to Spears of Indiana; Nominations Showed Interest of Contractors in Roadside Development



G. H. Spears

IT is a pleasure to announce that the winner of the National as well as the Southern Section Roadside Development Award for 1940 for the greatest contribution to roadside development by a highway contractor in his section of the country and in the United States goes to W. A. Corbett of Norman, Okla., for his exceptional interest, suggestions, ingenious tools, and extra work without compensation on a 7.157-mile roadside development contract for the Oklahoma State Highway Commission.

The Central Section Award winner, making the greatest contribution to roadside development in that section, is G. H. Spears, Superintendent for the Grace Construction & Supply Co., Fort Wayne, Ind., for work on a 21-mile grading project north of Elwood, Ind., for the Indiana State Highway Commission. The W. A. Corbett Construction Co. was organized in 1939, and Mr. Corbett states that he put forth his best efforts on this job, hoping for future work in that state. He has had considerable previous experience in the general contracting business, having been connected with Bailey-Burns Construction Co. of Norman, Okla., in both field and office capacities from 1925 to 1934, and with the Manhattan Construction Co. of Muskogee, Okla., from 1934 until 1938. Mr. Corbett has been indirectly connected with

However, honorable mention goes to the Glassell General Construction Co., of Shreveport, La., for its contribution on a 3.826-mile roadside-development contract on the Cheniere-Calhoun Highway in Ouachita Parish, La.

The presentation of these Awards will be made at the annual convention of the Associated General Contractors which will be held in Houston, Texas, February 17-20, all of the Award winners being A.G.C. members.

One of the interesting features of the Award to W. A. Corbett is that the work for which he received the National Award was on his first contract for the Oklahoma State Highway Commission. The W. A. Corbett Construction Co. was organized in 1939, and Mr. Corbett states that he put forth his best efforts on this job, hoping for future work in that state. He has had considerable previous experience in the general contracting business, having been connected with Bailey-Burns Construction Co. of Norman, Okla., in both field and office capacities from 1925 to 1934, and with the Manhattan Construction Co. of Muskogee, Okla., from 1934 until 1938. Mr. Corbett has been indirectly connected with

the Oklahoma City Branch of the A.G.C. since 1925, and has been a member of the Highway Division since 1939.

In nominating Mr. Corbett for one of the 1940 Awards, Maurice J. Day, Roadside Improvement Engineer of the Oklahoma State Highway Commission, and J. R. Keith, Resident Engineer on the job, stated that Corbett showed throughout the job an exceptional willingness to do anything for the betterment of the work, often at his own suggestion and at his own expense. Among other things, he suggested and constructed at his own expense numerous ditch checks and surface ditches in places subject to erosion.

In nominating G. H. Spears, Superintendent for Grace Construction & Supply Co. of Fort Wayne, Ind., for his contribution to roadside development on a \$700,000 grading contract north of Elwood, Ind., Henry J. Schnitzius, Landscape Supervisor of the Indiana State Highway Commission, and Robert M. Andrew, Project Engineer, stated that the infiltration of landscape methods into general construction is becoming so common in Indiana that certain of the larger contractors are accepting responsibilities far outside any original contract, and that the work of Mr. Spears and his firm is representative of this type of cooperation by contractors with the State Highway Commission. Among the specific contributions made were the care exercised in preserving trees which would otherwise have been lost, dressing borrow pits at no expense to the state, and extra work in dressing shoulders although this increased the work about four times standard shoulder finishing.

On its \$45,019 roadside-development contract in Louisiana, the Glassell General Construction Co. of Shreveport, La., was nominated for excellent workmanship and unusual cooperation with R. H. Vaughan, Resident Engineer, Torbert Slack, Roadside Development Engineer, and their assistants. Very bad weather hampered the beginning of this work, and the contractor showed great patience and care in reshaping many parts of the project which were damaged by rains. Another feature was the care in preserving trees and in saving many roadside shrubs as well. Ashton Glassell is President of this contracting organization and Melvin Hall was Superintendent on this project.

Hazardous Highway Made Wider and Safer

Nooseneck Hill, As Great a Hazard as Name Implies, Improved by Dual-Type Pavement on R. I. 3

(Photo on page 1)

NOOSENECK Hill on Rhode Island Route 3 between Westerly and Providence has long been synonymous with the slaughter of innocents, for invariably accidents on the long hill with its narrow bridge and turn at the bottom involved three cars, only one of which was really responsible for the accident. To remove this hazard and to continue its program of building safer highways, the Division of Roads of the Rhode Island Department of Public Works awarded a contract to M. A. Gammino Construction Co. of Providence, R. I., for the construction of FAP-19(2) and 26(2), 3.8 miles of dual pavement with some heavy grading and the widening of the bridge at the bottom of the hill.

The pavement consists of two lanes of 8-inch uniformly thick concrete slabs 11 feet wide, separated by a 25-foot strip of 8-inch bituminous-macadam pavement comprised of a 5½-inch crushed-stone base course and a 2½-inch top course. Outside the concrete lanes are 2-inch thick cold-mixed shoulders 9 feet wide on fills and 10 feet wide through the bottom of the ditch on cuts. The cold-mix pavement is underlaid by a 6-inch gravel base course. The entire roadway from center line to the shoulder is built with a crown of ¼ inch per foot.

Heavy grading was started November 20, 1939, and concreting began June 27, 1940. The original contract date for completion was August 1, 1940, but this

was extended to October 1, 1940, because of the long period of bad weather in the first six months of 1940.

Winter Grading

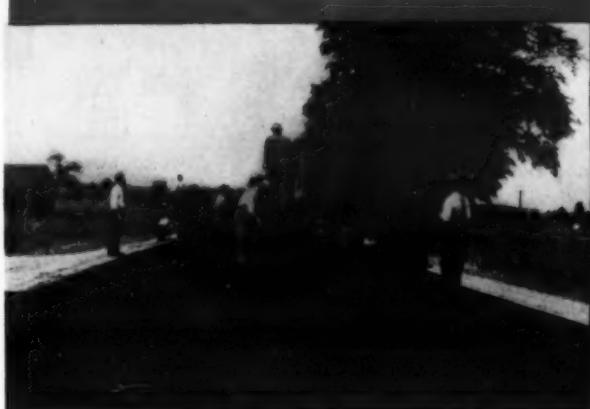
The contract required the use of considerable heavy equipment during the period of widening the roadway through the early months of the work. For the entire time this job was under construction, through traffic on Route 3 was detoured around the work. A Northwest 1½-yard and a 1½-yard shovel, a Marion 1½-yard, a Northwest ¾-yard shovel, a Northwest ¾-yard trench hoe and a Universal truck crane mounted on a Mack truck handled most of the grading, with two Lorain 77's doing the shoulder and final slope work. Three Euclid scrapers powered with Cummins diesel engines and pushed by RD8 tractors

(Continued on page 18)



C. & E. M. Photo
The outside of the stone masonry wall of the bridge across Big River at the foot of Nooseneck Hill between Providence and Westerly, R. I.

THESE STREET AND HIGHWAY PROJECTS OF 1940



MUSKEGON COUNTY, MICH.—An Intermediate-type TEXACO Asphalt surface, consisting of a plant-mix of Medium-curing TEXACO Cutback Asphalt and aggregate, was laid by two mechanical spreaders on 5½ miles of Bailey Road.



WILMINGTON, N. C.—After removing the car tracks from Front Street, replacing them with a Penetration Macadam sub-base and Sand Asphalt base, a TEXACO Sand Asphalt pavement was laid from curb to curb.



SALISBURY, CONN.—A traveling plant was used to mix and lay TEXACO Rapid-curing Cutback Asphalt and crushed gravel in the construction of roads for the Southbury Training School.

WILL
HELP
YOU
PLAN
FOR
1941



COLORADO—During 1940, low-cost surfacing constructed by the Read-mix method, using TEXACO Slow-curing Asphaltic Oil, was laid on hundreds of miles of the Colorado State Highway System.



WICHITA, KANS.—The heavy traffic on this section of Douglas Avenue is now carried by a TEXACO Sheet Asphalt pavement and guided by traffic lines of TEXACO Emulsified Asphalt covered with Joplin flint.



VIRGINIA—Ten miles of old mixed-in-place asphalt surface on U. S. 60 in New Kent County was resurfaced with TEXACO Asphaltic Concrete, using pit-run gravel for aggregate.

Request the practical cooperation of a TEXACO engineer in choosing the type of asphalt construction best suited to your conditions.



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Contractors and Engineers Monthly

THE NATIONAL BUSINESS PAPER FOR CIVIL ENGINEERING CONTRACTORS AND HIGHWAY ENGINEERS AND COMMISSIONERS

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Highways for Defense

To say that needed highway work, no matter how much there is of it, can not be carried through in a relatively short space of time without conflicting with the most essential defense activity seems to us not only indicative of a defeatist attitude but also to have serious potential consequences. There is nothing which this country needs for defense which we can not achieve if we set out to do so.

In his special statement to CONTRACTORS AND ENGINEERS MONTHLY on needed highway work for defense, appearing on page 31 of this issue, John M. Carmody, Administrator of the Federal Works Agency, says:

"Such a system (the 30,000-mile inter-regional system recommended by the PRA) would be of value in accommodating the increased traffic resulting from defense activity. The express highways recommended through large cities where traffic is now congested would do much to speed up transportation. But such a program can not be carried through in a short space of time without serious conflicts with the most essential defense activity. These things must necessarily take their place in the long-term highway program."

Granted that certain highway work, particularly the access roads, must take precedence, for the time being, over other work, the road-building industry has enough experienced contractors, enough equipment or the capacity to produce enough, and the organization through the Public Roads Administration and the state highway departments to handle any demands made upon it. The record achieved on the Pennsylvania Turnpike is an outstanding example of what careful planning, experience, co-operation and determination can accomplish.

Over a period of time the PRA and the state highway departments have planned carefully and wisely for future needs. In many cases plans and specifications for needed highway and bridge projects are ready, awaiting only one thing—and that is funds.

Certainly it will be a long-term program if needed defense highways must wait until Federal-Aid appropriations, decreased in the 1940 Highway Act, which will be matched by equal funds from some states and not by others because the money is being diverted to other uses, make possible the highway program. This year there will be available about \$600,000,000, it is estimated, a sum which would just about pay for needed highway work in New England alone. At this rate, it will be 20 or 30 years before our highways system is in order, and we can't wait that long!

The premise on which our defense program is based is that this country is facing an emergency. Everything this country believes in and stands for is hanging in jeopardy in the world today. If it be-

comes necessary for this country to go into action to preserve the American way of life, it will doubtless be within the next 5 years, not 20 or 30 years from now. The forces of evil and aggression won't wait until we have prepared in a leisurely fashion a long-term program. They will strike where and when they can do so most effectively.

Most people who have given the problem any consideration at all agree to the importance of adequate highways in the defense of this country, but they don't seem to realize that at best road building is not a speedy procedure. Even if we begin now, it will be several years before our highway system approaches adequacy. The longer the start is postponed, the longer it will be before we are ready.

Two things are essential: first, special appropriations for highway construction as soon as possible after Congress convenes; and second, diversion of gas-tax and motor-vehicle fees to non-highway uses must be stopped. According to the American Automobile Association, approximately \$1,000,000,000 has been diverted during the past 10 years. This sum would more than pay for the 1,800-mile network of super-highways suggested by Walter A. Jones, Chairman of the Pennsylvania Turnpike Commission, as necessary for adequate defense and described in our article on National

Your Gas-Tax Money—What Happens To It?

If some morning you miss that five dollars, set aside toward the coal bill, from your pants' pocket, and then your wife comes home with a new hat, that's diversion! And if you pay eight dollars to some one on the promise that he'll build wide safe roads for you to drive on, and one dollar of the eight is given away to charity, that's road-tax diversion.

This explanation of diversion was released in Chicago by the Illinois Road Builders Association in its continuing fight to have a bigger proportion of the road-tax dollar spent on the construction of new highways. And Illinois is not alone in its problem, for all too many other states have regularly been diverting the money they collected for highways to definitely non-highway purposes.

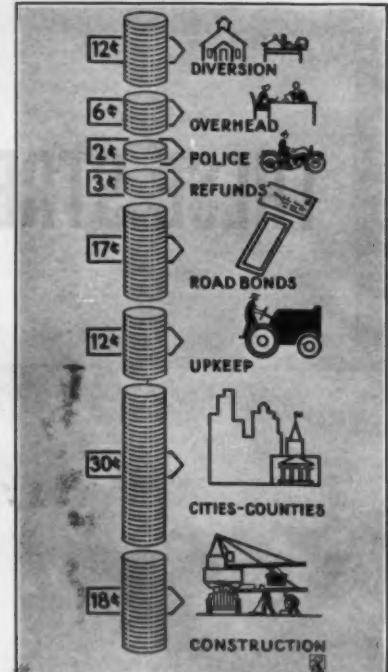
The Illinois Road Builders Association statement continued: "The average Illinois motorist doesn't understand road tax diversion or there would be a terrific howl. He does remember, though, that when the state legislature voted the license fees and the gas tax, it was with the promise that the motorist's tax dollar would go for modern roads. Well, it doesn't."

"Less than 40 cents of the road tax dollar goes into state, county and city construction. The other 60 cents is eaten up by overhead, road bonds, maintenance, policing and refunds. Of course, the 17 cents which goes to road bonds is

Defense in this issue.

Highways are an urgent need. Still more urgent is the need for funds to build these highways. Congress and the President must be made to realize that, given sufficient funds, the road builders of this country can launch a program of road and bridge construction and reconstruction which in a few years will provide the army and navy with highways adequate for defense, and at the same time provide industry and civilian traffic with sufficient and safe highways to carry on their preparations for defense and their peace-time pursuits.

It is a unique feature of highway construction that it is practically the only phase of preparations for defense which plays an equally important part in the industrial and cultural progress of a country secure and at peace.



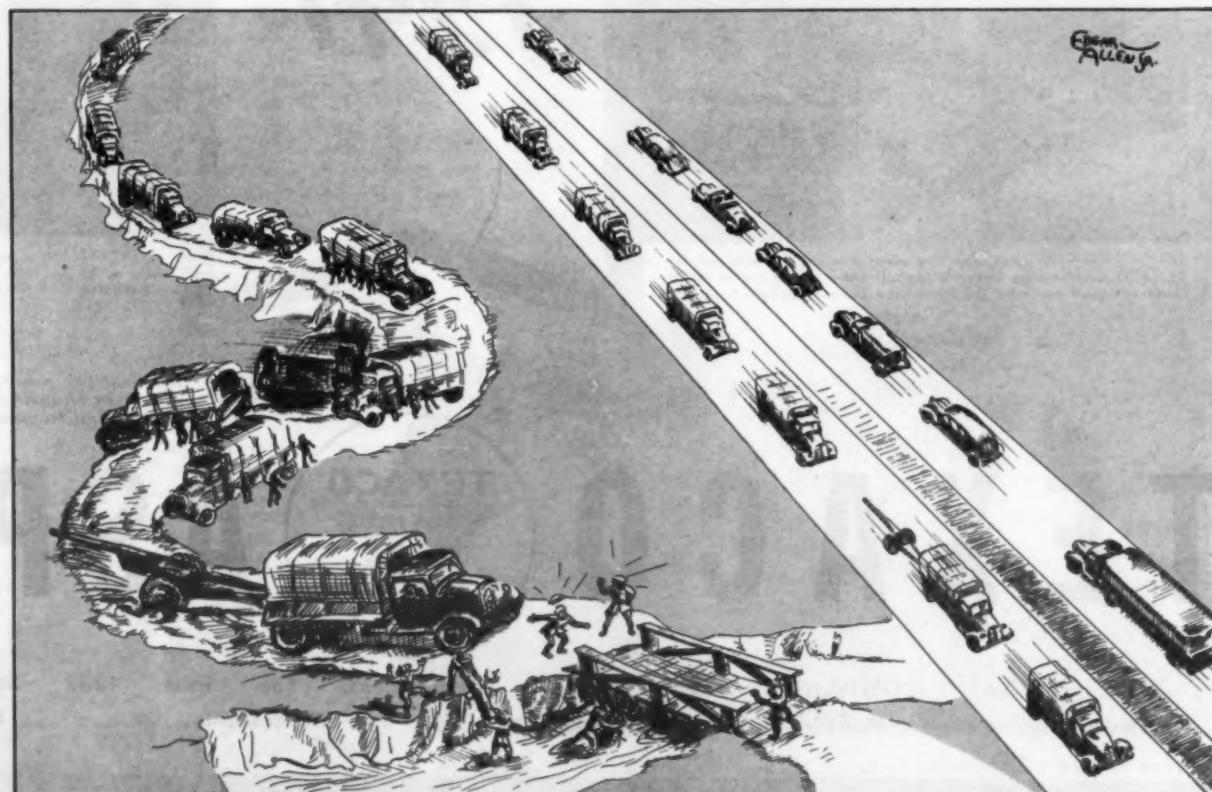
The distribution of Illinois' license-fee and gas-tax dollar.

payment of interest and principal on roads built years ago and now out-of-date or falling to pieces.

"Twelve cents doesn't sound big enough to get worried about, but that proportion of each tax dollar has equalled \$58,992,668 in Illinois since 1931. That figure is only slightly less than an entire year's receipts from Illinois gas tax and car licenses and would have built approximately 150 miles of super-highways outside of cities, (almost the distance from the Chicago city limits to Springfield along Route 66), equivalent in quality to the Pennsylvania Turnpike; or it would have built almost 20 miles of city super-highways at \$3,000,000 a mile. In other words, it would have completed the construction of two of the six proposed super-highways in and near Chicago."

"Roads for Defense" is the pertinent topic of the 1941 Convention of the American Road Builders' Association to be held at the Hotel Pennsylvania, New York City, January 27-30, 1941. Highway preparedness means military preparedness. Don't miss this meeting!

DEFENSE HIGHWAYS—WHICH SHALL WE HAVE?



Floodlight Units Aid In National Defense

Floodlighting equipment is in greater demand today than at any time during recent years, according to the National Carbide Corp., Lincoln Building, New York City. Rushed construction schedules for buildings, drainage, highways, airports, new cantonments, and many other types of emergency construction is largely responsible for the increased quantity of orders. There are many indications, however, that many lights are being purchased for the protection of property through additional illumination, where other methods of lighting

are inconvenient or impossible.

The National Carbide Corp. offers a number of styles of carbide lighting equipment, ranging from hand lanterns to individual floodlight units, from 1,500 to 16,000 candlepower. Detailed information on this equipment may be secured direct from the manufacturer by mentioning this item.

Two-Stage Compressors

A new bulletin has recently been issued by the Chicago Pneumatic Tool Co., 6 East 44th St., New York City, presenting improvements in several details of construction of C-P 2-stage com-

pressors in capacities of 350 to 10,000 cubic feet per minute for pressures of 80 to 125 pounds. According to the manufacturer, the Simplate multiple-disc valve possesses the greatest flow area for a given valve diameter, affording low air velocities and therefore low power consumption. Modern cylinder design, with streamline passages and effective water-jacketing of cylinders and heads contribute to the efficiency of these compressors. Improvements in the details of capacity regulation, main frames, bearings and other parts have rendered these machines even more reliable and durable.

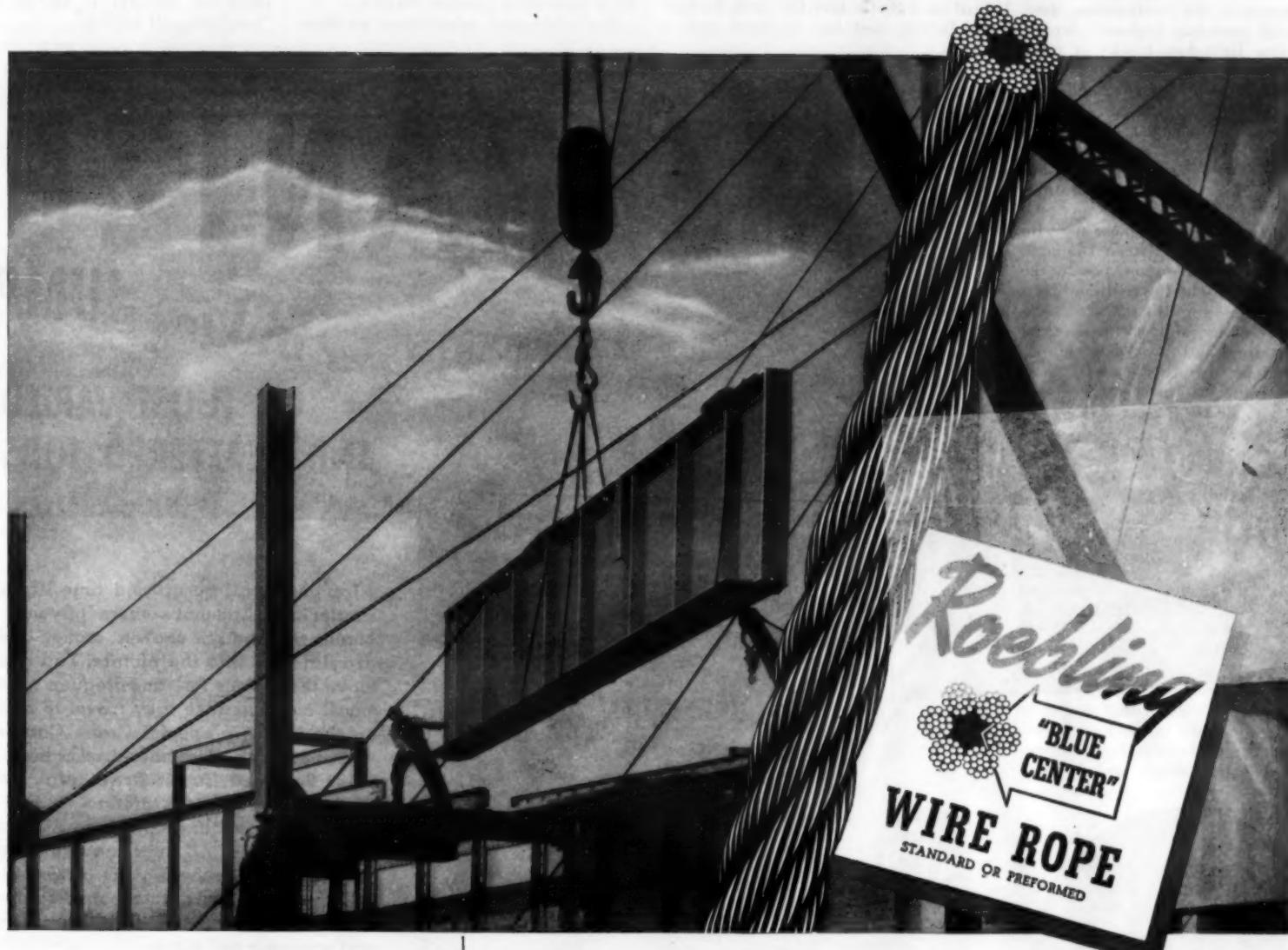
Copies of Bulletin No. 726 describ-

ing these improvements in detail may be obtained direct from the manufacturer by mentioning this item.

Caterpillar Promotions

Announcement has been made by the Caterpillar Tractor Co., Peoria, Ill., that Donald A. Robison, General Sales Manager, has been made a Vice President of the company, in charge of all selling and advertising activities. Mr. Robison has been associated with Caterpillar for many years. Gail E. Spain, Manager of Sales Development, will succeed Mr. Robison as General Sales Manager.

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WHAT DOES Roebling Research mean to you? It means just this—that when you install Roebling "Blue Center" Wire Rope you can be certain that you will get in return the very last notch of service and safety which scientific rope development can assure.

When buying wire rope keep in mind that Roebling is not content to "follow the pack". Roebling's efforts to give you a rope that will assure the longest and safest service possible, means constant research—checks and investigations out in the field. It means constant laboratory research—in one of the country's most modern research units. Equally im-

portant—it means up-to-date thinking.

However, it's the service Roebling "Blue Center" Wire Rope is actually giving that's "proof of the pudding". Ask our local representative to give you the facts. Then install Roebling "Blue Center". Keep accurate service records. Compare. We are confident you will agree with others that Roebling "Blue Center" Wire Rope assures the utmost safety and lowest rope replacement cost.



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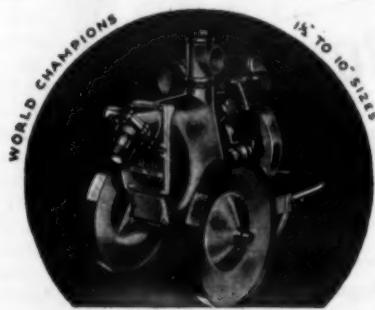
The new International Model K-5 with all-steel welded dump body.

New Truck Models Announced for 1941

Of interest to the contractors, state, county and township highway departments using light-duty trucks in rated capacities from $\frac{1}{2}$ to $1\frac{1}{2}$ tons is the International line of five new models in that capacity range, including the $\frac{1}{2}$ -ton Model K, $\frac{3}{4}$ -ton Model K-2, 1-ton Model K-3, $1\frac{1}{4}$ -ton Model K-4, and the $1\frac{1}{2}$ -ton K-5. Wheelbases range from 113 to 177 inches and gross vehicle weight ratings from 4,500 to 13,500 pounds.

Among the features of these new Internationals is the new Green Diamond engine which, in three sizes, powers the five new models. The International Harvester Co., Chicago, Ill., states that exhaustive research and a far-reaching testing program have proved the ability of these engines to provide more power with improved performance and greater fuel economy. International also announces new and efficient hydraulic brakes on all of these models. Two-shoe double-anchor-type brakes provide improved braking ability for trucks of various sizes. On Models K-4 and K-5 an entirely new but fully proved type of rear wheel brake, known as the Hi-Tork, is used.

Other features include an all-steel cab with quickly adjustable seat; improved steering; standardized cab-to-rear-axle dimensions; full-floating rear axle, except in the $\frac{1}{2}$ -ton and $\frac{3}{4}$ -ton models; roller-bearing anti-friction universal joints; improved self-aligning propeller shaft center bearings in the long-wheelbase chassis; rubber-cushioned three-point engine mounting; sealed beam



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headlights; mechanical shift starter; oil bath air cleaner; sturdy truck-type clutches and transmissions; and two-speed rear axles in the $1\frac{1}{4}$ and $1\frac{1}{2}$ -ton models.

Standard bodies of many types are available in various sizes for each of the three lighter models, with standard stake, dump, and other body types available for the larger units.

New Rock-Drill Mounting

A new air-feed rock-drill mounting, known as the Jackleg and designed for use with I-R Jackhammers, has been announced by the Ingersoll-Rand Co., 11 Broadway, New York City, to help support the drill, absorb the recoil, and feed it forward as the hole is drilled into the rock.

The larger and faster drilling Jackhammers can now be used on horizontal holes. Instead of the operator holding up the drill by hand and pushing it forward as it drills into the rock, he uses the Jackleg and has to exert only a



An I-R Jackleg in operation with a Jackhammer.

slight downward pull on the handle of the Jackhammer to balance the lifting force exerted by the pneumatic feed of the Jackleg. The Jackleg weighs only 35 pounds and can easily be regulated by a convenient pressure throttle.

For additional information an illus-

trated folder, Form 2690, is available from the manufacturer or from this magazine.

Manganese Steel Replacing Cast Steel in Crawler Shoes

A sharp increase in the use of manganese steel for tractor tread shoes for power shovels has been reported by the Pettibone Mulliken Corp., Chicago, Ill. This swing to manganese steel for shovel tread shoes has taken a sudden increase in just the past few months and the present volume of orders indicates that it is fast replacing the ordinary cast steel shoes, it is stated.

Manganese steel is particularly suited for work under the severe operating conditions imposed on power shovels because it becomes tougher and more resistant to wear, abrasion, impact and other stresses the longer it is used. Its acceptance by shovel men all over the country is typical of the many new applications industry is finding for this "toughest steel known."

MECHANIZE

and *GET the JUMP*

ON THOSE VARIED
AND SCATTERED JOBS

Job costs will be up and time limits shorter in '41. And that's where Universal-Lorain mechanized shovels, cranes and draglines fit into the picture. You can move these units fast and frequently at small cost because they travel to and on the job on a special Crane Carrier equipped with 10 rubber-tired wheels. Their Balanced Center Drive turntable assures ample power, strength and capacities for handling a wide variety of work efficiently. All units are available with convertible shovel, crane, clamshell, dragline and backdigger boom equipment which increases their versatility and economy still more.

Mechanized Moto-Cranes*—Moto-Shovels—Moto-Drag— the newest things on wheels, yet a proven quantity both as to design and performance. If you want to service more jobs at a saving of time and money, write for new fully illustrated 24-page catalog describing these modern Universal-Lorain units.

UNIVERSAL CRANE DIVISION
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UNIVERSAL LORAIN MOTO-CRANE*

NO JOB TOO SMALL OR SHORT—NO JOB TOO BIG OR TOUGH

County Construction Of Black-Top Roads

Vanderburgh County, Ind., Cuts Mileage Built in 1940 Because of Funds; Has One Central Garage, Evansville

With the aid of WPA, which furnished the asphalt and gravel, Vanderburgh County, Indiana, in 1939 surfaced 41 miles of county roads with a 2-inch road-mix 18 feet wide. The program was curtailed because of lack of funds in 1940, when only 15 miles was surfaced, financed solely by County funds, and 6 miles with WPA furnishing the asphalt and gravel as before. The major part of the work during the last two seasons has been maintaining the 800 miles of county roads, mostly gravel, which supplement the state highway system of 58.43 miles of roads in this county of 225 square miles.

Organization and Financing

The Board of County Commissioners, consisting of three men, two of whom are elected every two years for a term of three years, appoints the County Highway Superintendent annually. The present incumbent, William Koestring, has been County Highway Superintendent for two years and prior to that was Assistant for fifteen years.

The income for the operation of the County Highway Department comes entirely from refunds by the state to the county from the state gas tax and motor vehicle license tax. In 1939, Vanderburgh County received \$134,148.77.

The Central Garage

Perhaps the term "central" garage is somewhat of a misnomer as it is located in Evansville on the Ohio River on the southern border of the county. It is, however, a "central garage" because here all of the repair activities are centered and storage facilities are available for all county-owned equipment. The garage was built about 20 years ago and is a brick structure with two wings housing the office, machine shop and storage garage. One of the wings is at present used as an office by WPA supplying labor for some county projects. A visit to the building leads one to believe that it is much newer, as only last year the entire outside of the structure was cleaned and all of the mortar repointed as a WPA project. The steel truss roof is of the saw-tooth type which furnishes a sloping skylight the entire length of the building, greatly increasing the natural illumination of the interior. It has a concrete floor over the entire area but part of this is covered with sawdust because of the dripping from asphalt trucks. The sawdust is easily removed with the drippings, thus keeping the garage floor in much better condition.

The main building also contains a large wash room with toilet facilities and a store room, under lock and key, for tires, oil, grease, lanterns and other of the more expensive stores. The garage is located on a siding of the Chicago & Eastern Illinois Railroad, so that aggregate and other bulky materials may be unloaded directly to the open storage yard. At the rear of the garage, close to the siding, is the boiler room and coal bin, the latter now being used by WPA for the manufacture of concrete

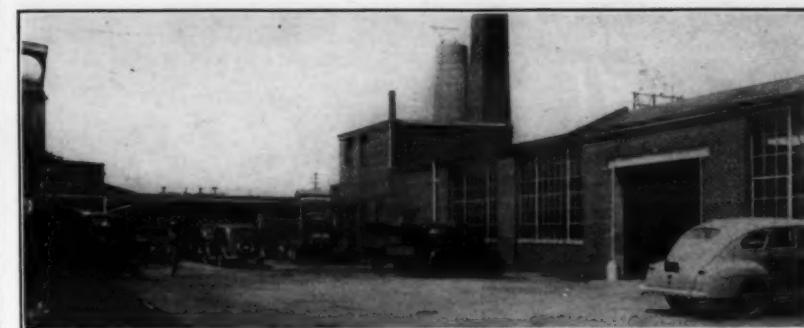
guard-rail posts.

The machine shop wing is similar to the main building but without the saw-tooth roof. In the shop is an acetylene welding and cutting outfit mounted on a 2-wheel hand truck, a Boynton & Plummer drill press mounted on one of the roof columns, a double grind stone, a J. A. Fay & Egan band saw, a Handy battery charger, made by the Baldor

Electric Co., a Lourie press for removing shafts and gears and operated by hand, and a separate small-parts stock room. The machine shop is heated by a Modine unit heater, as is the main building, and it also has a concrete floor.

For lubrication of all equipment in the main garage, an Ingersoll-Rand 30 garage compressor provides pressure for

(Concluded on page 55)



C. & E. M. Photo
The Vanderburgh County central garage on the outskirts of Evansville, Ind.

Thousands of Truck Engines Giving ENTIRELY NEW RESULTS

They Prefer TEXACO

- ★ MORE SCHEDULED AIRLINE MILEAGE WITHIN THE U.S. AND TO OTHER COUNTRIES IS FLOWN WITH TEXACO THAN WITH ANY OTHER BRAND.
- ★ MORE BUSES, MORE BUS LINES AND MORE BUS-MILES ARE LUBRICATED WITH TEXACO THAN WITH ANY OTHER BRAND.
- ★ MORE STATIONARY DIESEL HORSEPOWER IN THE U.S. IS LUBRICATED WITH TEXACO THAN WITH ANY OTHER BRAND.
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- ★ MORE TOURISTS USE TEXACO FIRE-CHIEF GASOLINE THAN ANY OTHER BRAND.

THE STRONGEST GEARED POWER FOR ITS WEIGHT IN THE WORLD

ALL STEEL HAND HOIST

SEATTLE, U. S. A.

COMPACT—POWERFUL—SAFE
"For use where power is not practical or available."
Manufactured in 2, 5 and 15-Ton Sizes.
For capacity comparison, $\frac{1}{2}$ " cable weight:
2-Ton "Lightweight" 75 ft.
5-Ton "General Utility" 250 ft.
15-Ton Triple-Geared "Special" 1200 ft.
Patent instant gear change and positive internal brake that never fails, and will hold load.
Gear Ratios Weight Seattle
2-Ton 4, & 22 to 1 60 lbs. 8 50
5-Ton 4, & 24 to 1 110 lbs. 8 75
15-Ton 4, 19 & 109 to 1 680 lbs. 8 250

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Cities and Foreign Countries Gladly Mailed.

WITHIN the past few months thousands of heavy-duty gasoline and Diesel engines have been giving a greatly stepped-up performance. These engines are keeping free from carbon, piston rings free in their grooves, filters, screens and oil lines open, free from sludge, increasing life of modern bearings.

The change made to bring this about was the adoption of Texaco 303 Motor Oil.

Texaco 303 Motor Oil assures freedom from sludge and carbon deposits over longer periods of time.

The outstanding performance that has made Texaco preferred in this field has also made it preferred in the fields listed in the panel.

These buyers are enjoying many benefits. You, too, will find important advantages when you use Texaco Lubricants and Fuels.

A Texaco Lubrication Engineer will gladly cooperate in making savings in your plant. Phone the nearest of more than 2300 Texaco distributing plants in the 48 States, or write:

The Texas Company, 135 East 42nd Street, New York, N. Y.

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FRED ALLEN in a full-hour program every Wednesday night, CBS, 9:00 E.S.T., 8:00 C.S.T., 10:00 M.S.T., 9:00 P.S.T.
METROPOLITAN OPERA every Saturday afternoon, NBC. See local newspaper for time and station.



**TEXACO Lubricants and Fuels
FOR ALL CONTRACTORS' EQUIPMENT**



The new Pacemaker portable quarry plant.

Roll Crusher Feature Of New Quarry Plant

Pacemaker is the name of a new compact portable quarry plant which has just been put on the market by the Universal Crusher Co., Cedar Rapids, Iowa, after undergoing a thorough test period. This plant is equipped with a jaw crusher for primary reduction and a new two-in-one roll crusher recently developed by Universal, one half of each roll being $\frac{3}{4}$ inch in diameter smaller than the other half.

Secondary reduction is done in two steps, the smaller of the divided rolls giving the initial secondary crushing and the other half, fed from the second deck of the 4 x 8-foot vibrating screen, giving a final secondary crushing. As a result, material can be fed through faster, giving the plant a larger capacity by combining the output of two roll crushers in a single unit.

The crushing cycle is claimed to be speeded up further by the use of the Universal Rotavator, a rotary elevator, an underslung conveyor and other short cuts on the conveying system, in order to minimize the handling from feed hopper to finished-material delivery conveyor.

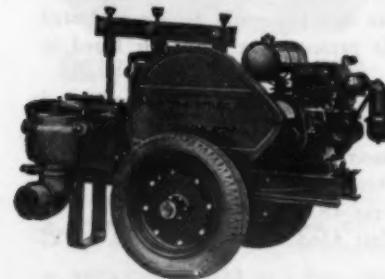
Power for the unit illustrated is supplied by a 95-hp Caterpillar RD8 diesel tractor equipped with a spline-shaft power take-off with universal joints which attach to a main jack shaft on the truck, which is provided with a sheave and V-belts for driving the plant.

The Pacemaker, which has a capacity of 100 to 130 yards an hour, is available with an 18 x 24-inch jaw crusher and 30 x 16-inch or 24 x 16-inch rolls with one split; with a 20 x 36-inch jaw crusher and either a 30 x 18-inch or 40 x 20-inch standard roll crusher; or a 30 x 16-inch crusher with the new two-in-one roll.

New Catalog on Jacks

A new 60-page junior catalog which readily fits into the vest pocket has just been issued by Templeton, Kenly & Co.,

4" Single Mud Hog Pump on Pneumatic Wheels



The "Old Reliable" Mud Hog brought up to date.

Gearing enclosed—running in oil.

All cut gearing.

Die-forged crankshaft in pump.

Available in the ball valve Force type,
or the flat valve Open Discharge.

Send for Bulletin No. CEM-40-D.

MARLOW PUMPS RIDGEWOOD, NEW JERSEY

Wheelbarrow Tire Needs No Inflation

The wheelbarrow, one of man's oldest conveyances, may now be equipped with a new rubber tire which combines the advantages of both the pneumatic and solid types, according to a recent announcement by the B. F. Goodrich Co., Akron, Ohio. This new tire for wheelbarrows and other industrial vehicles is called the Goodrich Silvertown cushion-type tire. Two types are available; the zero-pressure type with hollow center, and a solid unit that is filled with highly resilient cushioning rubber.

Like a pneumatic tire, the new unit combines lightness, cushioning qualities and streamlined appearance, and also has the sturdy construction and load-carrying capacity of a 4-ply pneumatic tire. Because of its body of cushion rubber, the new tire eliminates tire failure from punctures or leaky valves, and requires no servicing such as inflation or repairs.

For wheelbarrows this new tire is

available in the 16 x 4.00 and 16 x 2.00 sizes, with carrying capacities of 645 and 240 pounds respectively. The larger unit is designed to fit the lug base wheels of the same size single-tube pneumatic tire, while a special wheel has been designed for the 16 x 2.00 size.

Equipment for County And State Highway Shops

Of interest to state and county highway engineers responsible for the maintenance of equipment in central or district garages and shops is the new Catalog No. 16-T on the South Bend Series S 16-inch swing precision lathes with attachments, accessories and tools. These back-gear lathes with belt drive to the spindle are available in quick-change and standard-change gear, in motor drive and countershaft-drive types.

Copies of this new catalog may be secured by those interested direct from the South Bend Lathe Works, 572 Niles Avenue, South Bend, Ind., by mentioning this item.

UNEXCELED!

*Bottom-Dump EUCLIDS
for hauling dirt!*

*Rear-Dump EUCLIDS
for hauling rock!*

1 Near Hancock, Md. THOMAS, BENNETT & HUNTER Inc. used three 13-yard Bottom-Dump EUCLIDS to haul about 100,000 cu. yds. of unclassified excavation on a 1.28 mile highway relocation contract. Working under a $1\frac{1}{2}$ Yd. shovel on hauls averaging 2600 feet one way, each of these Euclids hauled about 8 full buckets per load and made from 5 to 6 round trips per hour.

2 At Topton, N. C. GREGORY & POOLE are using three 15-ton Rear-Dump EUCLIDS to haul about 100,000 cu. yds. of heavy excavation on a 6.3 mile highway improvement contract. Working on a shuttle operation with road traffic maintained, these large 10-yard Euclids have proved unequalled for this type of job.

3 These jobs are representative of scores of small and medium sized highway contracts throughout the country on which numerous contractors have learned—and proved—that more profit can be made with Rear-Dump EUCLIDS and Bottom-Dump EUCLIDS.

THE EUCLID ROAD MACHINERY CO.
Cleveland, Ohio

EUCLID

SELF-POWERED
EARTH • ROCK • COAL • ORE
HAULING EQUIPMENT

EUCLID
THE PIONEER

Open Highways In Winter Vital to Defense Program

Main Routes for Civilian Traffic Must Also Carry Supplies and Army Units, Regardless of Weather

By ERNST LIEBERMAN, Chief Highway
Engineer, Illinois Division of Highways

COOPERATION between the state highway organization and the Federal Government to expedite the movement of military supplies, equipment, and personnel over Illinois highways during the winter months also coincides very closely with the need for keeping uninterrupted the regular flow of traffic which is now utilizing the highways for general transportation purposes.

The armies of the present day require products from manufacturing plants in quantities and amounts so far in excess of that required by the armies of older days as to make comparisons useless. Today, soldiers may find that their duties are fully as much in the repair, upkeep and operation of mechanical equipment as in marching, drilling, and trench digging.

In Illinois, army concentration centers are at Fort Sheridan and the Great Lakes Naval Training Station, north of Chicago; at Camp Grant, south of Rockford; at Chanute Air Field at Rantoul; and at Scott Field near Belleville. Manufacturing plants furnishing materials essential to the armed forces are located at the U. S. Arsenal at Rock Island; at the proposed munitions manufacturing plant near Elwood; at the munitions manufacturing plant near Alton; at the ordnance proving ground at Savanna, and at the truck and tractor manufacturing and assembly plants at Chicago, Peoria, and Springfield.

In addition to Government aviation centers at Chanute Field and Scott Field, there are a considerable number of public and privately owned and operated fields and air schools of major importance, located around Chicago, at East St. Louis, Springfield, Peoria, and at numerous other places in various parts of the state. These fields not only serve as training centers but may also be used, if necessary, by the army forces. From the cities in their vicinity these fields are supplied with essential commodities of gasoline, oil, repair parts, tools, and personnel. Although some of these are small, they have an important place in the scheme of air operations, and the

highways leading to them are an essential link in maintaining their usefulness and efficiency.

Other essential military needs are the gasoline and oil supplies from refineries located at East St. Louis, Wood River, Pana, and at Whiting, Indiana, immediately adjacent to the Illinois state line. In addition are the areas productive of raw materials, such as the oil fields of south central Illinois at Centralia, St. Elmo, Flora, Martinsville, and the other scattered areas. Other products for military uses are the coal, manufactured steel products, glass, food stuffs, and many items of raw materials which the



A line of traffic waiting for the snow plow to break a passageway through the drifts on Route 26 in northern Illinois in January, 1940. Open roads are important to civil and commercial traffic and vital to national defense.

state produces for outside shipment.

To furnish supplies required for military use calls for a regular flow of raw products from sources of supply to man-

ufacturing and processing plants and of finished products from these plants to military supply depots and cantonments.

(Continued on page 43)

AMERICAN CABLE TRU-LAY *Preformed* Wire Ropes ARE UNIFORM

UNIFORM IN QUALITY This is a universally acknowledged characteristic of American Cable's Wire Ropes.

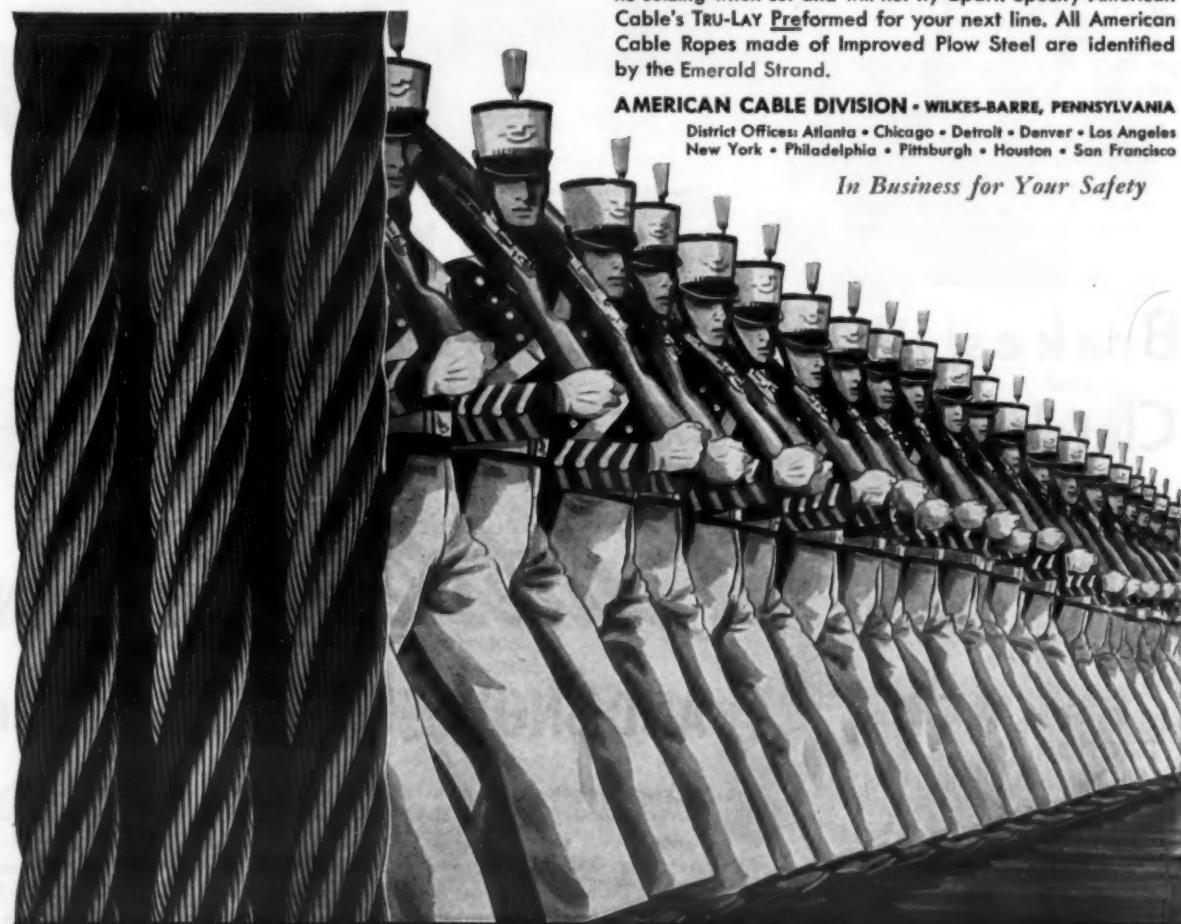
UNIFORM IN SERVICE Being uniform in quality, American Cable's Ropes are naturally uniform in service. When American Cable introduced TRU-LAY *Preformed*, in 1924, we gave all industry a rope that far outlasted ordinary non-preformed, our own make included. Here, too, in increased service, there is uniformity for when one TRU-LAY

Preformed Rope does a job unusually well, the second or twenty-second TRU-LAY Rope will do equally well.

UNIFORM IN SAFETY TRU-LAY *Preformed* is a safer rope. Its crown wires lie flat and in place so that there is less danger of their wicking out and jabbing workmen's hands, which often causes blood-poisoning. TRU-LAY handles easier and faster, resists kinking and whipping, spools on drums better and rotates less in sheave grooves. TRU-LAY requires no seizing when cut and will not fly apart. Specify American Cable's TRU-LAY *Preformed* for your next line. All American Cable Ropes made of Improved Plow Steel are identified by the Emerald Strand.

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AMERICAN CHAIN & CABLE COMPANY, Inc.

**PILE HAMMERS
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Special Equipment
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Write for descriptive catalog.

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ESSENTIAL PRODUCTS . . . AMERICAN CABLE Wire Rope, TRU-STOP Emergency Brakes, TRU-LAY Control Cables, AMERICAN Chain, WEED Tire Chains, ACCO Malleable Iron Castings, CAMPBELL Cutting Machines, FORD Hoists and Trolleys, HAZARD Wire Rope, Yacht Rigging, Aircraft Control Cables, MANLEY Auto Service Equipment, OWEN Springs, PAGE Fence, Shaped Wire, Welding Wire, READING-PRATT & CADY Valves, READING Electric Steel Castings, WRIGHT Hoists, Cranes, Presses . . . *In Business for Your Safety*

Defense Construction Is Speeded Up on All Fronts

(Continued from page 1)

The Program Under Way

Since last June about one-third of the 1940 volume of construction has been for defense or industrial expansion required by the defense program, amounting to nearly \$2,000,000,000.

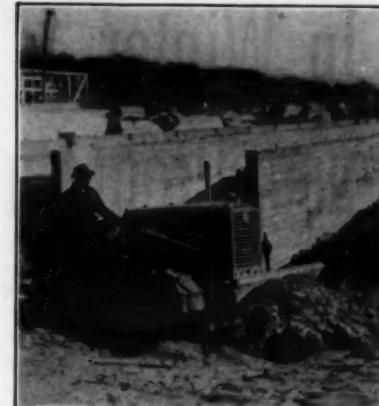
The initial defense bill voted by Congress in August, 1939, provided \$2,000,000,000, of which an estimated \$200,000,000 was for construction. This was followed by the "Speed Up Bill" of June, 1940, appropriating another \$3,000,000,000. Of this about \$225,000,000 was for construction. In July the first supplementary bill, appropriating \$1,700,000,000, added \$380,000,000 to construction funds; the secondary supplementary bill in August provided \$5,000,000,000 more, of which \$620,000,000 was for construction; and in September the third supplementary bill for an additional \$1,800,000,000 was passed, swelling the funds for construction by about \$550,000,000. This made a total of \$13,500,000,000 for defense, with \$1,975,000,000 for construction. This sum includes the appropriation for industrial plants and equipment. At the end of 1940, approximately \$860,000,000 of civil engineering construction contracts had been awarded.

One of the immediate needs in the defense program was that of housing for the increased personnel of both the army and navy. The total funds available for temporary army housing is \$540,000,000, including money from the defense appropriation as well as from the United States Housing Authority and the Public Buildings Administration. All of this work will be complete by June 1, 1941, and about 90 per cent is now completed. Most of this work has been done by contract, awarded on a cost-plus-a-fixed-fee basis, in accordance with the procedure decided by the Quartermaster Corps to be most satisfactory for those projects where work must be under way with the greatest possible dispatch.

Contracts have been awarded and work is now under way on at least thirty-five army training camps, amounting to approximately \$190,000,000. These camps are located in 22 states and the Canal Zone. In addition, work is going

on at seven major army arsenals and depots, at an aggregate cost of \$13,853,000.

The naval public works construction program under way at navy yards and shore stations is the greatest in the nation's history, according to a report by Rear Admiral Moreell, Chief, Naval Bureau of Yards and Docks, on the activities of the Bureau during the fiscal year 1940. These activities will increase during this fiscal year. Admiral Moreell reported that during the fiscal year 1940 the Bureau of Yards and Docks expended \$81,864,734, as compared with \$48,089,574 in the fiscal year 1939 and \$14,761,018 in the fiscal year 1938. In addition, it was stated that during the fiscal year 1940, 688 projects were awarded, totaling \$183,762,017. The amounts available for obligation by the



Most urgent in the army construction program is housing for the increased personnel. Here an Allis-Chalmers WM tractor and Gar Wood bulldozer, owned by Potts & Callahan of Baltimore, are grading around concrete foundations for new barracks at Camp Meade, Md.

Bureau for the years 1938-1941 inclusive are revealed in the report to be \$33,408,078 in 1938, \$114,157,355 in

1939, \$156,849,584 in 1940, and \$302,170,050 in 1941.

Among the major naval projects, exclusive of air bases, on which contracts have already been awarded are the construction of shipbuilding docks at Norfolk and Philadelphia, at an estimated cost of \$17,000,000; shipway, barracks, building extensions and accessories at Portsmouth, N. H., at an estimated cost of \$1,130,000, including the fixed fee for the contractor; general improvement at the submarine base at New London, Conn., estimated at \$2,303,000, including fixed fee; building ways and facilities for armored docks at New York, at an estimated cost of \$1,775,000; aviation, ammunition and fuel storage facilities for the Puget Sound area, Washington, \$7,300,000; and sub-assembly shop and steel storage runways at the Navy Yard, New York City, \$1,520,000.

The Rivers and Harbors Bill recently passed appropriated \$37,085,000 to the U. S. Engineer Department for work considered valuable to the national de-

(Continued on next page)

MARMON - HERRINGTON All-Wheel-Drive



"It has given us a smoother road surface, faster than any equipment we ever had. We use it to pull much larger trucks through when the going is bad."—A New England Town Board.



"Our Marmon-Herrington All-Wheel-Drive converted Ford was the only truck on the job that could reach the dump with a load. The rear axle was often completely buried in the sand," writes a well-known contractor.

"Outstanding IN MUD, SAND AND SNOW," Says Prominent Firm of General Contractors

Year after year Marmon-Herrington All-Wheel-Drive converted Fords have proven themselves veritable "little giants" in all sorts of general construction and road work. 1941 models are better yet, because they incorporate all the improvements in design and construction which have been developed through the years by The Ford Motor Company, and by Marmon-Herrington engineers. Truly, there are no other trucks, at any price, which can surpass these powerful, fleet and economical

vehicles for performance when the "going" is really tough. We convert all standard Ford trucks, passenger cars and commercial vehicles to All-Wheel-Drive in the same plant where Marmon-Herrington heavy duty All-Wheel-Drive trucks are built. Write for literature on any or all of these vehicles, and ask for a demonstration by our dealer in your territory. You will be amazed at what these vehicles will do, and agreeably surprised at the low prices. Cable address MARTON.

Brakes and Clutches
with Positive, Easy Action and Long Wear Life
IF
you use
PALMER
FRICTION & BRAKE BLOCKS & LININGS

on your
TRUCKS, POWER SHOVELS,
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The correct size and type for any make and model industrial machine.

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MARMON-HERRINGTON CO., INC. • INDIANAPOLIS, INDIANA, U. S. A.

Army, Navy Air Bases Rushed to Completion

(Continued from preceding page)

fense. An example of the importance of U.S.E.D. projects is the flood-control work now under way at Hartford, Conn., at a cost of \$1,640,000, to protect communications between that city and the Pratt & Whitney Aircraft Engine Co. in East Hartford.

Adequate Airports?

The experience of war-torn Europe has given us here in the United States an opportunity to learn many things which can be of tremendous advantage to us in our defense program, if we are wise enough to learn by others' experience.

While present events indicate that a war can not be fought and won entirely in the air, certainly no observer of the European conflict can underestimate the importance of adequate air facilities, for no war can be won on land or sea without air supremacy. And such supremacy requires, of course, sufficient air fields for the operation of planes. Another important point we have learned is the advisability of scattered air fields, sufficiently near each other that, in case of damage to one, there will be other bases of operation from which to carry on in that area.

"The passing of this nation's geographical isolation due to the shrinking of the Atlantic Ocean by the long-range bombing plane, and the infiltration of European aircraft and air men in Central and South America, have converted our national defense problem into a problem of hemisphere defense," Oswald Ryan, member of the U. S. Civil Aeronautics Board, stated recently. This means that our air force must be large enough and strong enough to meet any emergencies in the far-flung Americas and consequently we must have the necessary bases to accommodate such a force.

Let's look at the airport situation. According to the Civil Aeronautics Authority, we had the following airports and seaplane bases on December 1, 1940:

AIRPORTS

| | |
|-------------------------|-------|
| Municipal airports | 708 |
| Commercial airports | 493 |
| CAA intermediate fields | 284 |
| Army airfields | 68 |
| Naval air stations | 22 |
| Marked auxiliary fields | 634 |
| Private fields | 127 |
| Total | 2,336 |

SEAPLANE BASES

| | |
|-------------------------------------|-----|
| Army, Navy and Coast Guard | 29 |
| Other seaplane bases and anchorages | 294 |
| Total | 323 |

The Army Air Corps reports that the total number of airports now in use and under construction is still insufficient for the defense of this country and it is estimated that we need 128 CAA airports and 100 army airports in the United States to meet our defense requirements. At present \$48,000,000 has been appropriated for military airports. This sum is not sufficient, but at this time the estimated additional appropriation needed is confidential and will not be released by the Army.

The major projects now under way at Army air bases are

| | |
|-----------------------------------|-----------|
| Mobile Air Depot, Ala. | 3,500,000 |
| March Field, Calif. | 1,042,000 |
| Lowry Field, Colo. | 4,600,000 |
| MacDill Field, Fla. | 3,000,000 |
| Cantonment, West Palm Beach, Fla. | 1,500,000 |
| Savannah Airport, Ga. | 1,550,000 |
| Chanute Field, Ill. | 7,300,000 |
| Scott Field, Ill. | 2,682,000 |
| Weather Field, Mass. | 6,000,000 |
| Patterson Field, Ohio | 1,500,000 |
| Wright Field, Ohio | 1,300,000 |
| Cantonment, Portland, Ore. | 1,142,000 |
| Ellington Field, Texas | 1,000,000 |
| Hill Field, Utah | 2,800,000 |
| Anchorage, Alaska | 1,800,000 |
| Elmendorf, Alaska | 1,700,000 |
| Albrook Field, Canal Zone | 8,500,000 |
| Howard Field, Canal Zone | 1,451,000 |
| Hickham Field, Hawaii | 6,700,000 |
| Wheeler Field, Hawaii | 1,500,000 |

The major naval air bases on which work is under way include

| | |
|-----------------------|------------|
| Alameda, Calif. | 14,810,000 |
| San Diego, Calif. | 5,600,000 |
| Jacksonville, Fla. | 29,760,000 |
| Key West, Fla. | 125,000 |
| Miami, Fla. | 3,500,000 |
| Pensacola, Fla. | 16,105,000 |
| Squantum, Mass. | 211,000 |
| Cape May, N. J. | 350,000 |
| Tongue Point, Ore. | 3,500,000 |
| Philadelphia, Pa. | 2,190,000 |
| Quonset, R. I. | 23,204,000 |
| Paris Island, S. C. | 285,000 |
| Corpus Christi, Texas | 28,000,000 |
| Norfolk, Va. | 12,710,500 |
| Quantico, Va. | 1,689,000 |
| Seattle, Wash. | 11,755,000 |
| Kodiak, Alaska | 3,400,000 |
| Sitka, Alaska | 2,900,000 |
| Coco Solo, Canal Zone | 15,814,000 |
| Guantanamo, Cuba | 3,473,000 |
| Pearl Harbor, Hawaii | 8,234,000 |



Construction is an important factor in our defense program. Here the Duval Engineering Co. of Jacksonville, Fla., is using a new Blaw-Knox finisher to speed work on a 20-foot wide paving slab for runways at the Naval Air Base at Jacksonville.

Robert H. Hinckley, Assistant Secretary of Commerce, reported on the national airport program to the American (Continued on page 22)



LINK-BELT SPEEDER

use 

WELDED DIPPERS

for greater value to their customers

THE selection of PMCO welded dippers by The Link-Belt Speeder Corporation is typical of the trend among shovel manufacturers all over the country. By using this weight saving reinforced welded dipper, shovel engineers are designing shovels trimmed to greater efficiency — greater capacity and smoother operation per dollar invested. This means greater values for the shovel user.

Prompt deliveries — more flexibility in design and low pattern costs for special dippers, are important features of the PMCO welded dipper when complying with emergency defense orders.

Write for bulletin No. 0100 and get the complete story.



A 2-yard PMCO dipper. It's buttressed and reinforced to meet operating conditions, not overburdened by foundry limitations — the modern fabricated dipper that eliminates dead weight.

PETTIBONE MULLIKEN CORPORATION
Established 1880
4710 West Division Street, Chicago, Illinois



Fulton Bag & Cotton Mills
Manufacturers Since 1872
ATLANTA ST. LOUIS DALLAS
MINNEAPOLIS NEW YORK NEW ORLEANS KANSAS CITY, MO.

Rebuilding U. S. 3 Into the White Mts.

**Heavy Grading in Ledge
And Boulders Completed
Near Woodstock, N. H. by
John Iafolla Const. Co.**

(Photos on pages 1 and 56)

THE meandering highway south of North Woodstock, N. H., well known to millions of visitors driving into the White Mountains from Massachusetts, was greatly improved during the summer of 1940 by FA 209-G(1) extending 4.24 miles with about 50 per cent relocation, many changes in grade, and a new road-mix surface. The contract for this work on the Daniel Webster Highway was awarded to John Iafolla Construction Co., of Dedham, Mass., on the original low bid of \$154,615.40, but a change of location in the last mile to eliminate two rather steep grades changed the total bid, by extension of the unit prices, to \$157,290.00.

Work was started on April 25, 1940, with November 1, 1940, the completion date. The total project was characterized by careful design, judicious handling of right-of-way problems involving moving or purchase of buildings, prompt action in emergency by the resident engineer to eliminate a bad traffic block, and unusually complete field servicing of equipment in the field by the contractor.

Design and Other Problems

With many side-hill cuts in solid ledge, disintegrated ledge and boulder formation, the cuts and fills were well balanced with a minimum of overhaul. Fills of this character must have at least 12 inches of earth over rock before the gravel subgrade is spread. In distinct contrast to the winding character of the old road, the new one is laid out for 500-foot sight distances at all joints.

In order to clear the right-of-way for the new line, it was necessary to move several houses, one 10-room summer home, two large barns, and numerous garages, while others were purchased outright and then resold at public auction or were demolished. The right-of-way damage was comparatively heavy

for the length of the highway.

Continuous Cut and Fill

The project was stationed from south to north beginning at Sta. 330 + 25. At Sta. 340 was a side-hill cut of 8,500 yards of boulders and earth requiring a large amount of blockholing. The first lift was side-cast and then the remainder loaded direct to trucks by one of the Lorain 79 shovels after the larger boulders were broken up. The project dropped off immediately into a 350-foot fill requiring 4,500 yards of material from excavation. The first 1,500 yards of this fill was bulldozed into place by an RD8 and LaPlant-Choate bulldozer from the north.

At Sta. 360 a ledge of granite of about 2,000 cubic yards was drilled with one



C. & E. M. Photo

Important to any concentration of construction equipment is the servicing and maintenance. John Iafolla has service, stock and tool trucks right on the job to minimize delays.

of the Sullivan wagon drills and then sufficiently broken up so that it could be loaded direct to the trucks without further use of explosives. This cut was directly opposite a typical New England church and also opposite a school house. No glass was broken in any of the windows in either building but every

time the ledge was to be shot, the school children were taken a few hundred yards down the road, much to their delight. Immediately north of this the rock was used for a 250-foot fill containing a total of 8,500 cubic yards. Between Stas. 397 and 398 about 1,500 cubic yards of ledge

(Continued on page 26)



RED DEVIL
LIGHT
and POWER PLANTS
800 to 50,000 WATTS



3,000 WATT
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This **GENERAL** Model 307 Clamshell
Crane is going right down the line of cars,
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Let the **GENERAL** help you
keep material on the move.

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SHOVELS
DRAGLINES - CRANES
Crawler & Wheel Mounted

THE GENERAL EXCAVATOR COMPANY, Marion, Ohio

Gasoline-Engine-Driven Portable Compressors

The Worthington Pump & Machinery Corp., Harrison, N. J., has available a new bulletin, No. H-850-B52B, devoted to its line of gasoline-engine-driven portable compressors. According to the manufacturer, the wide selection of mountings makes it possible to obtain a Worthington compressor suited to any class of service. Those illustrated include wood-skid mounting, two-wheel spring trailer, four-steel-wheel towabout, truck-mounting, four-wheel spring trailer and rubber-tire-wheel

towabout. In addition, rail car, power take-off from truck engine, and special types are available.

Construction features are described and illustrated and specifications are given in this bulletin, copies of which may be secured direct from the manufacturer by mentioning this item.

New Reference Book on Plant-Mixed Asphalt

Helpful facts about asphalt plant design, operation and care, accumulated from the experiences of many operators over a period of 50 years, are con-

tained in a folder recently issued by the Simplicity System Co., Chattanooga, Tenn. Problems in all asphalt plants such as the destructive effect of heat, the wearing effect of sand and grit on all moving parts, high fuel costs, and others are discussed, with explanations of how each problem is solved in the Simplicity plant. In addition Simplicity plants and accessories are described and illustrated, and specifications are given. According to the manufacturer, additional data sheets pertaining to asphalt plants and asphalt paving will be mailed from time to time for insertion in this folder.

Copies of this reference book may be obtained gratis from the Simplicity System Co., by writing on your business letterhead.

New Pipe Warehouse To Be Constructed by Bethlehem

Bethlehem Steel Co., Bethlehem, Pa., has announced plans for a new pipe warehouse and increased finishing capacity to round out the facilities at its new continuous-weld pipe mill at its Maryland Plant, Sparrows Point, Maryland. The new warehouse will increase storage facilities 70 per cent.

THE FIRST 10 "CATERPILLAR" DIESEL TRACTORS

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strong*

You can expect long-term, economical service from a "Caterpillar" Diesel Tractor. These first ten tell you that! Yet what they have to tell you is *only the beginning*. Because, as dependable and serviceable as these machines have been, today's "Caterpillar" Diesel Tractors are even more so!

These are not only the first Diesel tractors built by "Caterpillar"—but the first practical Diesel track-type tractors ever constructed. Each now has thousands of hours of hard work behind it . . . and is still putting out low-cost power! Here is evidence that the basic "Caterpillar" design and construction were right from the start. And while they are basically unchanged, they have been improved through these ten years of experience!

Today, for example, you get "Hi-Electro" hardening of the track roller-rims and shafts, track-pins, cylinder-liners, crankshaft, and such parts that must fight the most wear. And today's "Caterpillar" Diesel Engine gives you *more than ordinary Diesel economy*—through its ability to operate efficiently on low-grade, non-premium fuel!

As a power-user, you owe it to yourself to know more about these first ten "Caterpillar" Diesel Tractors and others of the *tens of thousands* that have come after them. Write today for a FREE copy of the 32-page book entitled "1,000,000 Hours of Diesel Satisfaction."

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS



No. 1. After nine years of the heaviest kind of jobs—contracting and logging—this machine still does a full day's work on the lumbering operations of Howell & Howell, Quincy, California.



No. 2. Saved W. C. Schuder & Son, Woodland, Calif., \$3750 on fuel in 7000 hours of operation. Still on active duty and still pulling such heavy farm loads as three 5-bottom 12-inch plows.



No. 3. This "Caterpillar" Diesel has done 18,683 hours of heavy pulling in the sugar-cane fields—and is still good for thousands more, according to its owner, the Oahu Sugar Company, T. H.



No. 4. Engine of the fourth "Caterpillar" Diesel has operated more than 30,000 hours! Now furnishing power for this gold-washing machine near Caledonia, Virginia. Works 10 hours a day.



No. 5. Started out on the Mississippi levees. Its engine has since powered two cotton-gins and a lumber mill. Now supplying power for a dragline. Has worked approximately 35,000 hours!



No. 6. A few details on this machine—in operation in Belgium—have been included in the brief history of the tenth "Caterpillar" Diesel Tractor, which is given below.



No. 7. At work for the Georgia State Highway Department since December, 1931. More than 16,640 hours of operation at the last report. Still handling its road-building and maintenance job.



No. 8. A few details on this machine—in operation in Belgium—have been included in the brief history of the tenth "Caterpillar" Diesel Tractor, which is given below.



No. 9. Went to work in 1932. On construction jobs for 5 years. Now leased to farmers and contractors. No accurate record of its hours of operation. Owned by E. C. Hale, Circle, Montana.



No. 10. Also Nos. 6 and 8 bought by Dumon & Vandervin of Belgium, in 1931. Still going on March 30, 1940. War conditions prevent obtaining complete details of their long work-record.

CATERPILLAR DIESEL

ENGINES AND ELECTRIC SETS • TRACK-TYPE TRACTORS • ROAD MACHINERY



The portable asphalt plant recently developed by Hetherington & Berner for Harry Hatfield & Co. of Barboursville, W. Va.

Portable Asphalt Plant Has Many New Features

An entirely new type of plant in the bituminous batching-plant field has just been developed by Hetherington & Berner, Inc., Indianapolis, Ind., for Harry Hatfield & Co. of Barboursville, W. Va. Unique design provides unusual portability for a plant of this type and capacity. The three main units of the plant, the mixing and weighing unit, screening and bin unit, and drier unit, all remain on the ground during operation and all are wheel-mounted.

The mixing unit includes a 2,500-pound pugmill mixer, a 2,500-pound aggregate weigh box and dial scale, the Fluidometer system for metering asphalt, and a 3-compartment storage bin with a capacity for about two batches. A gasoline power unit, mounted on the frame, is used for driving the pugmill and triple elevator which feeds the 3-compartment bin. This unit is constructed as a semi-trailer unit and may be pulled by any standard truck tractor when moving. A tandem axle is provided for the rear wheels of this unit.

Feeding the triple elevator of the mixer is the bin and screening unit. This unit is full wheel-mounted and may be towed by any standard dump truck. The 3-deck vibrating screen is mounted on a 12-ton 3-compartment bin, and a gasoline engine, mounted on the unit, is provided for driving the screen and feed elevator. This elevator is used to convey material from the discharge of the drier to the screen and may be folded for transportation in the same manner as the elevators on the mixer unit.

The third unit of the plant is the rotary drier, also on a semi-trailer and using the same tandem axle for hauling as does the mixing unit. This is a standard drier, with exhaust fan, combustion chamber, and cold material feed elevator. All units of this drier are also driven by a gasoline engine, mounted on the drier frame.

Reflector Signs

Uniformity of traffic-sign design and colors is important if the full effectiveness of the signs is to be obtained, particularly as the public becomes more and more educated to the correct meaning of certain types of signs and signals.

Stonehouse traffic signs, made by Stonehouse Signs, Inc., 9th & Larimer Sts., Denver, Colo., closely follow the recommendations in the "Manual on Uniform Traffic Control Devices for Streets and Highways." These signs are made of rust-resisting steel, finished with baked flexible enamel which will with-

stand severe weather conditions, and the lettering is stenciled on with a high-grade screen-process paste to assure a clean-cut built-up legible letter readable for a long distance.

The reflector buttons used in these signs are sealed in place under pressure and can not be removed. Each reflecting lens is protected by an individual housing, making the buttons damp-proof, weather-proof and theft-proof.

Literature describing and illustrating Stonehouse signs, either plain or reflectorized, in a variety of sizes to suit all requirements may be secured by interested state and county highway engineers direct from the manufacturer.

Trip-Blade Snow Plow For Truck Mounting

Fast mobile equipment for snow removal must be ready to swing into action immediately when snow begins to fall, in order to keep traffic rolling. The Model 115 Sno-Flyr reversible trip-blade plow is designed for speedy snow-removal service, as a complement to the larger heavier plows.

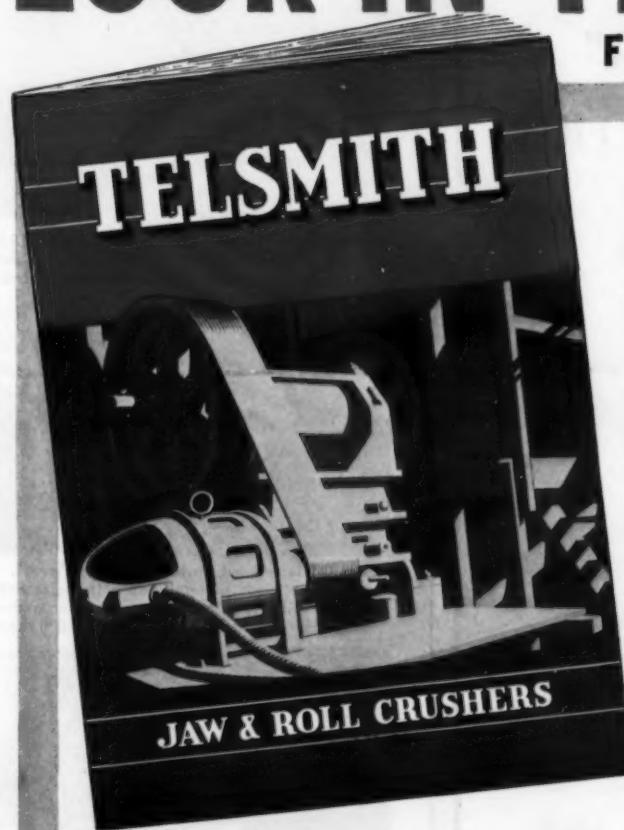
This Bros Sno-Flyr is ruggedly constructed, with all load-carrying factors strongly reinforced and rigidly braced. The cutting edge of the 9-foot moldboard is of tough high-carbon steel, and a deep angle iron running the entire length of the moldboard supports more than one-half the width of the cutting

edge for added strength. Reinforcing plates and angle irons are arc-welded to the moldboard, forming a single unit. A sturdy center channel and two angle iron side braces give added rigidity to the circle.

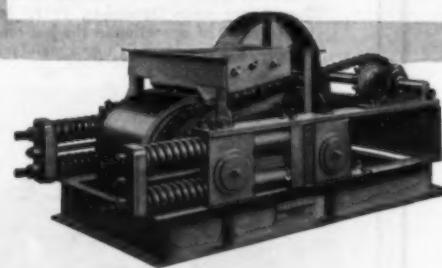
Under-frame hitches are used exclusively. The pushing is done from the truck frame in the rear of the cab and the front of the truck frame or bumper. The Sno-Flyr is equipped with self-aligning runners mounted on the circle but always tracking in a straight line with the truck frame, regardless of the angle of the moldboard. The plow easily passes over any obstructions because the trip springs are extra long, providing a full tripping action. The springs are completely enclosed to prevent freeze-ups.

Literature describing the Model 115 Sno-Flyr, as well as the medium-duty Model 96 and the heavy-duty Model 140R, may be secured by interested state, county and township highway engineers direct from the Wm. Bros Boiler & Mfg. Co., Road Machinery Div., Minneapolis, Minn., or from this magazine.

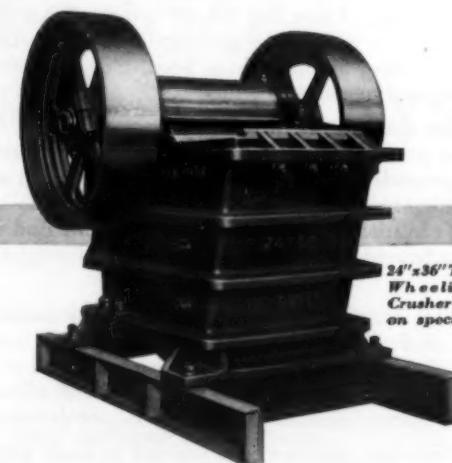
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Write for Bulletin JR-34.

JR-1-C

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Brown M. & S. Co., Louisville, Ky.
United Steel Sales Company, Cincinnati, Ohio

New County Airport Made Defense Link

**Snohomish County, Wash.,
Has 870-Acre Up-to-Date
Airport; Grading, Drainage
And Runway Paving**

By CLARENCE HICKEY, County Engineer, Snohomish County, Washington

STARTED as a county work relief project, the Snohomish County Airport, located 8 miles southwest of Everett, Washington, and 21 miles north of the civic center of Seattle, has now assumed an increased importance in the chain of air fields necessary to our national defense. The field lies 1½ miles east of the shore of Puget Sound and at an average elevation of 585 feet above sea level, above all major land obstructions in the vicinity and above most fogs. For this reason it has been approved by the Civil Aeronautics Authority as an alternate field to be used by air lines when fog prevents landing at Seattle.

The land originally purchased for this airport consisted of 640 acres. The County has since acquired 230 acres of adjoining land, making a total of 870 acres. The terrain was rolling in character and covered with large stumps and small second-growth trees, necessitating very heavy clearing, grubbing and grading.

When completed, the field will have four runways: the east-west runway which is 5,000 feet in length; the north-south runway, 5,800 feet long; and the northeast-southwest and the southeast-northwest runways, each of which are 5,200 feet in length. These runways are graded 800 feet in width and the landing strip on the north-south runway is paved to a width of 200 feet. The paved landing strips on the other runways will be 150 feet wide. The north-south runway will have the necessary controls for blind landings, and will be one of about ten runways in the country to be so equipped by the Civil Aeronautics Authority.

The present building program, contingent on county financing, includes the construction of an administration building with a total floor area of approximately 40,000 square feet and one hangar building which, with the adjoining shop, will have a floor area of approximately 50,000 square feet. In addition, a water and fire-protection system, to cost about \$55,000, will be installed, water for which will be taken from the Everett water main along the Pacific Highway, about 1¼ miles from the field.

Under the National Defense Program, Snohomish County has now entered into a lease arrangement with the United States Army to rent to the Government, for \$1.00 a year renewable annually for 25 years, an area of about 60 acres to be used as an Air Corps base. The lease also allows the Army unrestricted use of the field and virtually all other flying, except commercial scheduled air lines, will be eliminated. It is the understanding at present that the Army will station approximately 2,000 men

at this field and will spend something over a million dollars for their own buildings.

It is expected that work at the Snohomish County Airport will continue throughout the winter and next summer and the entire project is scheduled for completion and placing in regular service in the autumn of 1941.

Grading

In November, 2,800,000 cubic yards of excavation had been completed, with about 300,000 yards yet to be removed. The task of clearing and grubbing the 870-acre tract was in itself a large undertaking, as it averaged about 80 stumps to the acre. Between 300 and 400 workers were given employment on these operations.



For the shorter hauls at Snohomish County airport, D8 tractors and Carryalls were used in grading this 870-acre tract.

The equipment used in these clearing and grading operations included a 1½-yard Lorain shovel, a Caterpillar RD8 with bulldozer, and a 220-foot Ingersoll-Rand compressor, all owned by Snohomish County. In addition, other equipment was rented from contractors under various rental agreements, and included one Austin-Western 12-yard scraper, one Woldridge 12-yard scrap-

er and five 14-16-yard LeTourneau Carryalls, five Caterpillar D8's, four Allis-Chalmers LO tractors, one A-C HD-10, one RD7, four bulldozers, and two excavators, one a 1-yard Bucyrus-Erie diesel dragline and the other a 1¼-yard Northwest gas shovel.

Due to the long hauls of surplus excavated material and to the presence of an

(Concluded on page 45)

Power
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Available in a wide range of models and types.

Briggs & Stratton . . . THE MARK OF MORE MOTOR VALUE

Dependable power that satisfies every performance demand — economical operation with a minimum of "servicing" during long years of performance — plus many other features have made Briggs & Stratton "Preferred Power" for hundreds of machines, tools and appliances.

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Minnesota Digs Itself Out Of Biggest Blizzard Ever

Three-Day Storm With High Winds Presented Unique Problems; Highway Dept. On Duty Day and Night

By C. L. MOTL, Maintenance Engineer,
Minnesota Department of Highways

(Photo on page 1)

ON November 11, 12 and 13, 1940, Minnesota experienced one of the severest snow storms and blizzards on record, considering the area covered by the storm, intensity of the wind, amount of snowfall, and the unexpectedness of the occurrence.

On November 9 and 10 the weather was generally warm and agreeable, with temperatures ranging well above freezing and rain falling in many areas. The severe storm swept into the state from the west during the night of November 10 and covered the entire length of the state from north to south over a front of 400 miles. Carried forward on winds ranging from 50 mph to isolated extremes of 80 mph, with the temperature dropping rapidly to around zero, the precipitation changed rapidly from rain to very heavy snow, which in some areas reached a depth of 16 inches in a time period of 12 hours.

As soon as it became apparent that a storm of unusual intensity was sweeping through the state, all radio stations were advised of the situation and they cooperated in broadcasting information to all communities; and the Highway Department made special arrangements to answer telephone calls coming in, keeping its force on duty day and night for a period of three days.

The intensity of the storm made it impossible to operate equipment in snow-plowing work and it was therefore necessary to let the storm blow itself out before starting operations. The storm lasted through the eleventh and most of the twelfth of November, and when the wind began to quiet down in the afternoon of the twelfth, all plowing equipment was put into action. By 9:00 o'clock a.m. on November 13, 7,300 miles of the state's 11,300-mile trunk highway system was open to traffic. It should be mentioned that many hundreds of miles of the system were not blocked at all, on account of the direction of the wind with respect to some of the highways and light snowfall in some small areas, but generally speaking, some work had to be done on practically the entire system.

Since the high wind swept a portion

of the roadways clean, the snow-plowing problem was confined to sections where the snow was driven in by the high wind, causing deep banks, some of which were only 100 or 200 feet through, but nevertheless blocked the roads completely.

Drift Prevention Ineffective

The snow fences erected were found to be ineffective in many locations, and in fact detrimental in that the large amount of snow piled behind the snow fences carried across the highway, although the fences were located at least 125 feet from the roadway. In



In Minnesota's November blizzard many of the deep drifts had to be "exploded" by trucks and snow plows driving into the snow bank at high speed.

some areas a good percentage of the snow fence was blown down by the high wind, as anchorages heretofore satisfactory proved to be insufficient due to high winds and the saturated soft condition of the ground. In many cases, groups of farm buildings as far as 500 feet from the roadway caused heavy snow banks to form across the highways, and small wooded areas, either

to windward or leeward, caused the formation of deep drifts and snow deposits.

Even the new-type streamline cross-section, with wide flat slopes, did not prove entirely effective where the direction of the highway happened to be at right angles to the direction of the wind. The extreme velocity of the wind

(Continued on page 34)

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| HOT MIX K.D. TYPE ASPHALT PLANT | AP-7 |
| HOT OR COLD MIX K.D. ASPHALT PLANT | AP-10 |
| HOT MIX TWO UNIT PORTABLE ASPHALT PLANT | AP-8 |
| SPEEDLINE PORTABLE ASPHALT PLANT | SP-1 |
| DRIERS AND ACCESSORIES | AP-5 |
| PUG MILLS | AP-4 |
| PORTABLE STABILIZER PLANTS | STAB-1 |
| PORTABLE, SEMI-PORTABLE AND STATIONARY WASHING PLANTS | WP-1 |
| PORTABLE PLACER MACHINES | |
| DRAG SCRAPER TANKS | X-1 |
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IOWA MANUFACTURING COMPANY ▶ Cedar Rapids, Iowa, U.S.A.

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NATIONAL CARBIDE CORPORATION LINCOLN BLDG. NEW YORK (Opp. Grand Central)

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Trouble developed with Swinging Frictions on Large Shovels in strip mining service. Rapid wear and frequent failures were causing costly delays and terrific maintenance expense—so they came to GATKE.

This proved to be the toughest friction problem encountered in 27 years of experience. Swinging heavy loads on a long arc was creating heat and wear so destructive that the best frictions stood up only a few days—some only a few hours.

GATKE'S long, practical experience and tremendous development resources were directed to the solution. Special materials were perfected to provide the powerful friction, resistance to heat, and long wearing quality necessary to meet service of unprecedented severity.

These specially developed GATKE Frictions are doing the job—giving many months of dependable service—eliminating costly delays and effecting amazing maintenance economies.

Don't forget that GATKE Development Resources are applied to old, as well as new or tough jobs. Every GATKE Product must be outstanding—must do the job as it should be done to offer genuine cost savings.

That's WHY using GATKE Frictions, Brake Lining, or Clutch Facings for ALL applications—LARGE or small—offers so many advantages.

Whatever the requirement, send data on the job to be done for the GATKE Recommendation.



Die-Pressed Blocks of Heavy Duty Woven



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C. & E. M. Photo
"Jake" Ableman, Superintendent for
M. A. Gammino Construction Co.

Dual-Type Highway Replaces Old Route

(Continued from page 2)

tors during loading worked through most of the winter. Other tractor equipment with bulldozers included a Caterpillar D8 with a LeTourneau bulldozer, an Allis-Chalmers Model L tractor with a Baker bulldozer, two Allis-Chalmers Model K tractors with Baker bulldozers, a Caterpillar RD6 with a LaPlant-Choclate bulldozer and another RD6 and bulldozer.

A bad frost boil condition had existed for several years at the north end of the job in a deep sand cut. This cut had shown an annual frost heave of 0.8 foot for years, and gradually became permanent. A 5-foot cut was made at this point and a clay vein removed for a distance of 175 feet, 70 feet wide, taking out about 450 cubic yards of material. There were three other similar clay veins on the job, all in sand cuts, which were treated in like manner.

A considerable amount of old concrete pavement had to be removed to make way for the new dual-type pavement. For this work the contractor used a Novo 2,800-pound drop hammer, mounted on a Ford truck and operating with a drop of about 8 feet. The wing walls and concrete hand-rail on the bridge at the foot of Nooseneck Hill had to be removed in order to permit construction of the 21-foot extensions on either side, and 3-inch wood sheeting was driven to form cofferdams above and below the bridge. A McKiernan-Terry No. 5 steam hammer operated by a 50-hp boiler was used to drive the sheeting. The boiler was used later for heating the mixing water for the concrete and maintaining steam under the tarpaulins, as the concrete was poured in cold weather.

Preparation for Concreting

After the heavy grading was completed and a true subgrade finished, a gravel base varying from 12 to 18 inches in thickness was spread the entire length of the job. A fleet of ten to twelve Mack trucks mostly owned by the contractor were loaded with gravel

by a Northwest 1½-yard shovel in pits about 2½ miles from the job. The gravel was spread on the grade by an Allis-Chalmers Model K tractor with a Baker bulldozer and a No. 10 Caterpillar power grader. Over the entire gravel base where concrete slab was to be poured, a 2-inch course of fine gravel was spread and rolled with a 5-ton Buffalo-Springfield gasoline-powered roller. This was particularly helpful in the final grading operation.

Just ahead of the form setters, a Caterpillar 10 power grader gave the final working to the cushion course and sometimes went back between the forms if it seemed a little thick. A total of eight men worked on the setting of the forms divided between five men on form trench, and one man setting, aided by the others handling forms. Back of these, two men lined up the forms. On the fine grade there were five men working with the roller and using two scratch boards. The Blaw-Knox 8-inch forms were well-cleaned when set and then one man oiled them by hand well ahead of

the setting of the expansion joint assemblies.

Along the shoulders, special catch basins consisting of precast concrete sumps 4 x 4 feet in section up to the curb inlet flow line were set in all the wet holes and were handled by the truck crane. These precast sumps have a 6-inch concrete floor and 12-inch walls. Above the flow line the catch basins were built up of brick. As many of the holes in which these sumps were set showed a great deal of water, a Domestic double-diaphragm pump and a 2-inch Gorman-Rupp centrifugal were used for unwatering the holes.

A considerable fleet of service trucks was used on the job, but all were kept busy. The fleet consisted of one gas truck, one form truck, one water truck for sprinkling the stone dust and four pick-up trucks.

Steel and Expansion Joints

The expansion joints, spaced 73 feet 6 inches apart, were made up of ¾-inch Johns-Manville cork filler with eleven

dowels at mid-depth of the slab. These dowels are ¾-inch round bars 2 feet long with red lead on one end and with 6-inch caps on the leadend. These were set so that the caps alternated on the two sides of the joint. The expansion joints were set with No. 10-gage metal installing caps placed over the top of the joint filler material and extending 3¾ inches down on one side and 1½ inches down on the other side of the material, and backed with a steel-plate bulkhead with openings for the dowels extending from the bottom at the bulkhead to the elevation of the dowel, and with 12-inch triangular shaped braces at either end to hold the joint assembly vertical during the pour. On this job it was reported that there was no trouble with tilted expansion joints. The dowels were all assembled with ¼-inch rods forming a frame to keep them securely in place and were furnished by the Concrete Steel Co. Two men placed the expansion joints, which were made up ahead by one man

(Continued on next page)

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38th ANNUAL

ROAD BUILDERS CONVENTION

PENNSYLVANIA HOTEL JAN. 27-31
NEW YORK CITY 1941

Jaw Crushers
10-16, 10-20, 12-20, 10-36, 15-36,
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**Impact Breakers,
Lime Pulverizers**

**Material and Snow
Bucket Loaders**

EAGLE CRUSHER CO., INC.
Galion, Ohio

HEAVY-DUTY CONSTRUCTION EQUIPMENT

Rhode Island Road Greatly Improved

(Continued from preceding page)

who worked one half day. The same men who spotted the expansion joints spread the reinforcing mats along the grade after they had been left in piles as removed from one of the service trucks. These same men also picked up the caps as they were removed by the finishers, cleaned them and carried them ahead for use repeatedly during the day.

The top half inch of the expansion joints left open after the removal of the installing caps was poured three days after the concrete slab had been completed. Blown asphalt was heated in a Hauck kettle and then poured $\frac{1}{2}$ inch high so there was ample opportunity for the material to contract on cooling and still leave it flush. Just prior to pouring, a novel method of cleaning the joints was used. One of the standard thin brooms used by electric railway companies for cleaning switches and equipped with a metal point on the end of the handle was used to chip out the concrete and shave down the cork if it was too high. Then the broom end performed its duty in sweeping the joint clear.

A crew of four men with a flat-body truck had charge of stripping the forms and carrying them forward to the form setters. They were kept busy throughout the job as on this contract the second slab was not poured adjacent to the first, which would normally cut down the amount of form setting by one half on the second slab.

Long Distance Batching

Since M. A. Gammino had been awarded four other large contracts in Rhode Island, it was decided to set up a large sand and gravel plant at Slocum in the town of Exeter, Rhode Island, to serve all of the jobs. This pit was covered with excellent loam which was stripped and used as the required loam fill on all of the jobs mentioned. The Nooseneck Hill job was under a slight disadvantage because of the long haul of 13 miles from the center of the job to the Slocum pit. This made it necessary to use from sixteen to twenty-four batch trucks, all hauling three batches per load. The hauling was done by sub-

contract.

At the plant a Northwest crane with a 50-foot boom and a 1-yard Blaw-Knox bucket maintained an adequate supply of sand and gravel in the bins of the Blaw-Knox batching plant.

Bulk cement was delivered at a railroad siding $1\frac{1}{2}$ miles distant from the plant, and stored as necessary in a 30-barrel Heltzel plant, which was used for unloading and temporary storage. The cement was then trucked to a shed over the receiving hopper of the large Blaw-Knox bulk cement plant at the pit. The bulk cement was hauled in steel tank trucks for complete protection.

The Wide Concrete Slabs

The foreman of the concrete crew working around the Ransome 27-E dual-drum paver, in which the batches were mixed for one full minute, sprinkled the grade as needed ahead of the paver. One man dumped the trucks and cleaned out the batch sections and one man operated the paver, turning out an average of 500 batches in a 10-hour day which

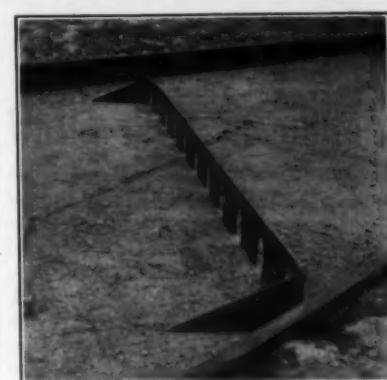
was equivalent to 1,911 feet of 11-foot pavement.

Water for the paver was furnished through a $2\frac{1}{2}$ -inch pipe for $\frac{3}{4}$ mile and then a $1\frac{1}{2}$ -inch pipe for the balance of the distance from the brook running at the bottom of Nooseneck Hill. A Chain-Belt Durex pump furnished the supply. The hose for the paver was carried across the slab out to the shoulder on a boom as the paver traveled on the section to be paved later with bituminous macadam and the water line was carried on the shoulder away from all possible damage by trucks. The valves on the water line were spaced 600 feet apart and the paver carried 350 feet of hose.

Three puddlers spread the concrete between the forms while one man spaded against the forms. Still another maintained an even roll of concrete against the front screed of the Lakewood double-screed finishing machine.

Hand Finishing and Curing

Two hand finishers and a boss fin-



C. & E. M. Photo
A bulkhead which assures a vertical expansion joint.

isher comprised the crew which took care of the slab behind the finishing machine. The first finisher floated the surface with a 4-foot long handled float, and the second finisher pulled a burlap drag over the surface. One of them then pulled the installing cap and edged the

(Concluded on page 49)

THE "99"

TOO!

• North - South - East - West . . . highway officials and contractors find they get more done with an A-W "99" Power Grader. And, no matter what the job . . . maintenance or construction . . . on ice-coated, snow-blocked roads, in wet, heavy soil or blow sand . . . a "99" does it quicker, cheaper and better. Thanks to the extra traction, power and maneuverability provided by All-Wheel Drive and All-Wheel Steer you can tackle any job in sight with a "99". You can swing into Spring clean-up work earlier, get through faster, start Summer construction weeks ahead of less efficient equipment; and the "99's" Extra Working Month a Year efficiency means more profit on low bid work . . . more work with limited budgets. Ask us to prove it! THE AUSTIN-WESTERN ROAD MACHINERY CO., Aurora, Ill.

AUSTIN-WESTERN

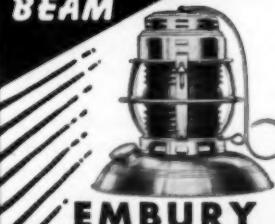
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SCREENING PLANTS

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ROLLERS
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The Warning Lantern

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Most modern of warning lights! Ruby Fresnel, self-magnifying safety lens. Burns three days and nights on a pint of oil. Non-tipping base. New type adjustable bail. Strong. Leak-proof. Storm tested.

BETTER PROTECTION
AT LOWER COST

Embry Mfg. Co., Warsaw, N.Y.

Seeding Rocky Slope Mulched With Straw

Subcontractor on Seeding on Ohio
Paving Job Completes 155-foot Slope;
Benches Cut to Aid Work

(Photos on page 56)

AROUND Labor Day, 1940, work had progressed well in preparing the rocky slopes of high side-hill cuts on FAP 147-A(1), northeast of Crown City on Ohio Route 7, for seeding. The sections already seeded had been favored by several rains and showed green through the protective mulch of straw. The largest side-hill cut, 155 feet measured along the slope, had three benches varying from 10 to 12 feet wide which were used as service roads in handling the equipment. These benches sloped back toward the face and carried drainage to the ends of the cut to prevent erosion of the face.

The original cut was made by Harvey Candel of Crown City, Ohio, contractor for the grading and reinforced-concrete pavement project, but the grading was done under a subcontract by Carl Myers of Salem, Indiana, and the seeding was subbed to the French Nurseries, Clyde, Ohio. In addition to hand rakes, the only equipment used for this work was a Wards twin-row rubber-tired tractor, a spring-tooth harrow, a hand-operated mechanical seeder, and a stone boat used to haul in the bales of straw.

Preparing the Slope

The contractor had removed 350,000 cubic yards of rock and dirt in making the side-hill cut which was to be seeded. Thus it can well be seen that conditions were not particularly favorable for a heavy growth of grass. To prepare this slope for seeding, the subcontractor ran the industrial tractor along the benches, pulling the spring-tooth harrow over the face of the slope by means of a long chain which was lengthened on each succeeding trip across to permit the harrow to work farther down the slope toward the next bench. Similarly, the harrow was run over the benches as work was completed on them and then a hand-operated seeder was used to apply 3 pounds of grass seed per 1,000 square feet of surface.

After the seed was carefully hand raked, to give a $\frac{1}{4}$ -inch cover, the entire slope was mulched with straw laid down 2 inches thick when loose, and over it binder twine was staked and in some cases tied to rocks hung over the face of the ledge to prevent the straw from being blown from the face of the slope.

Certain sections of this face will be planted in vines later to cover some of the bare rock and to help further to hold the soil in place and prevent erosion. None of this work was watered artificially, complete reliance being placed on rain and the heavy fog in this section to help the seed to germinate.

Personnel

The work of the subcontractor on seeding, French Nurseries, Clyde, Ohio, was done under the direction of Homer Kerr, Inspector for the Ohio Department of Highways. H. H. Dunn was Project Engineer for the Ohio Department of Highways for the entire contract.

Internally Lubricated Wire Rope for Long Life

Safety depends much upon internal conditions, in government, in business, in personal health, in machinery, and in wire rope, the Macwhyte Co., Kenosha, Wis., points out in a recent release announcing its folder on Macwhyte inter-

nally lubricated wire rope.

A feature of the construction of this Whyte Strand preformed wire rope is the heavy viscous tenacious lubrication force-fed around every wire in every strand of this rope. This protective coat of armor guards against destructive elements and reduces internal friction to a minimum.

New literature discussing "the why in Macwhyte internally lubricated wire rope" may be secured by interested contractors and engineers direct from the manufacturer by mentioning this item.

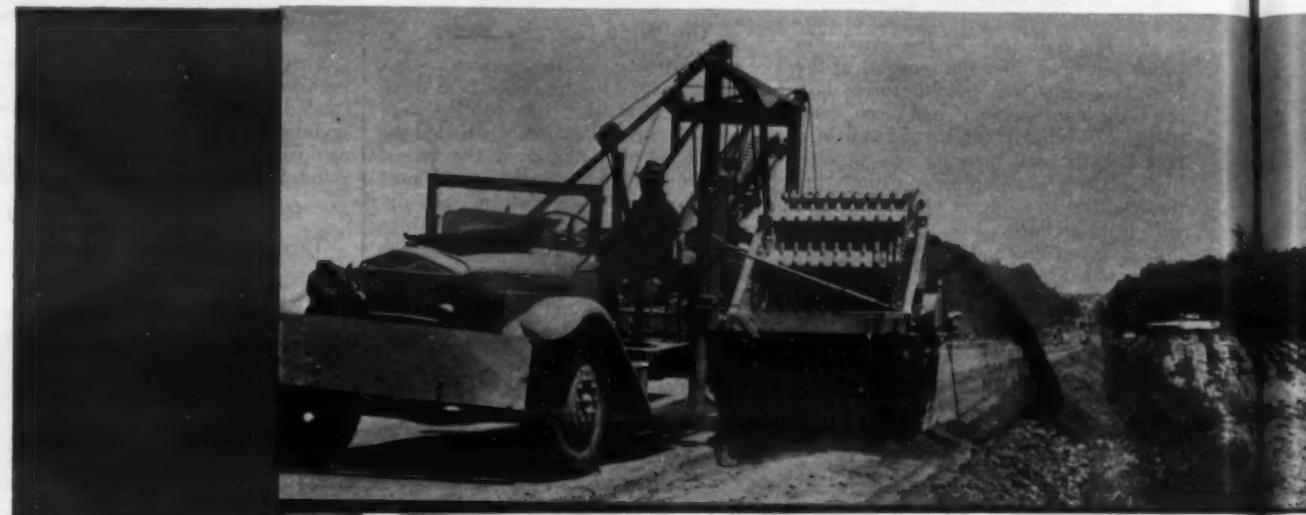
New Impact Tools

A new set of hydraulic tools for riveting, vibrating, concrete breaking, tamping, pile driving, hammering, and general demolition is made by the S & W Hydraulic Tool Co., Inc., P. O. Box 182, Memphis, Tenn.

Operated by means of a hydraulic column from power plants of 1 hp upwards, either electrically or engine driven, the S & W hydraulic impact tools are claimed to be free of shock and vibration because of a special recoil de-

vice which enables bucking the most severe type of work. Hair-trigger accuracy permits the operator to deliver at will a powerful blow or a gentle touch to the work, merely by the pressure of a finger. The hand implement is so constructed that any type of tool is immediately interchangeable in the chuck without the use of wrenches or special tools.

Further information on S & W hydraulic impact tools is contained in a catalog, copies of which may be secured direct from the manufacturer.



Buckeye pay



ON every job where Buckeye equipment carries the load, it pays in the I.O.U.'s—every piece of equipment in line pays—and pays well.

An accumulation of experience has to pay off before the country became high-spirited—sound engineering all through the

✓ **TRENCHERS** By far the most complete wheel and boom type models for every digging requirement—dig in anything from solid rock—simplified controls—that's no better way to make trench for sewer, water main and service pipe, electric and telephone cable and conduit and for road and basement drainage than with Buckeye.

✓ **SHOVELS** Buckeye Clippers feature the (original) Vacuum Power Control—smooth, effortless operation, (just like auto gear shift)—operators can and will go all through the shift and finish up fresh. Clippers hoist, swing and travel simultaneously. You can "feel" the crowd in the hand as with steam.

Quickly convertible to trench hoe, crane, line, pile driver or lifting magnet. Other features shovel operators prefer, only Buckeye has them all. Model 50, $\frac{1}{2}$ yd.; Model 60, $\frac{3}{4}$ yd.

✓ **R-B FINEGRADERS** Machine integrates better, faster, cheaper. It eliminates inaccuracy, reduces hand labor, cuts loss of yield to

Contractors and Engineers Monthly for January, 1941

New 20-Inch Band Saw

A new 20-inch band saw for use as a stationary shop tool, as a portable individual unit on construction jobs, or as an attachment on C. H. & E. saw rigs has recently been announced by the C. H. & E. Mfg. Co., Milwaukee, Wis. This saw is available with a gasoline engine or electric motor, or without power.

This new C. H. & E. band saw incorporates all the latest features of band saw construction, the manufacturer

states, including aluminum wheels with flanged face, eliminating the need for adhesives to hold the wheel bands in place. Both upper and lower wheels run in sealed ball bearings. A spring tension device maintains the proper strain on the saw blade, and ball-bearing roller guides are provided both above and below the table which is of cast iron and can be tilted at a 45-degree angle. The machine is completely enclosed and guarded for safety.

A new 4-page bulletin, BS-40, describing and illustrating this band saw may

be secured direct from the manufacturer by mentioning this item.

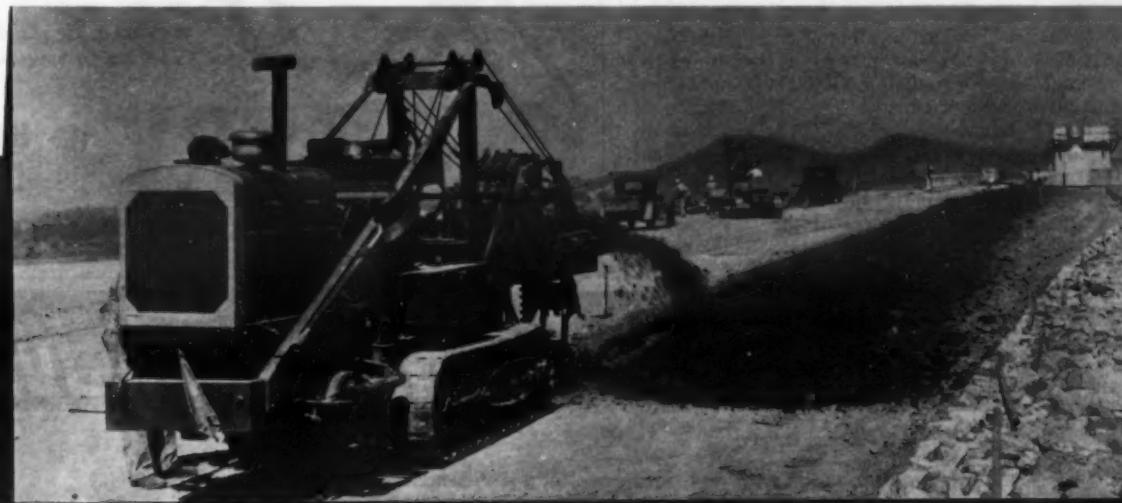
New Arc Welder

A rugged heavy-duty gasoline-engine-driven portable arc welder which, it is claimed, can go places in a hurry and handle heavy-duty work anywhere on the job has recently been announced by the Hobart Bros. Co., Box CE, Troy, Ohio.

A six or eight-cylinder counterbalanced industrial-type motor, silent in

operation and free from vibration, is direct-connected to the Hobart simplified arc welder. Remote control is available at no extra cost. The chassis is sturdy, with a portable mounting and trailing hitch providing speedy travel over smooth highway or rough terrain in getting to the job and in moving about on it.

Further information on this new Hobart arc welder may be secured by contractors and state, county and town highway engineers direct from the manufacturer or from this magazine.



ays on the line!

Buckeye equipment is
pays on the line—no
quiment in the broad

ence that dates back
became highway con-
ll through the line and

most complete line—
els for every trench
n anything short of
ols—there's no faster
trench for sewer and
pe, electric and tele-
and for road, airport
n with Buckeyes.

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avel simultaneously.
in the handle, same

ch hoe, crane, drag-
magnet. Of the 24
refer, only Buckeye
1; Model 60, $\frac{5}{8}$ yd.;

hine in grading is
minated inaccuracies,
of yield to a mini-

extensive production facilities—the reasons why
Built by Buckeye ✓ is your ironclad guarantee of
the most that can be had in dependable performance and worthwhile profits.

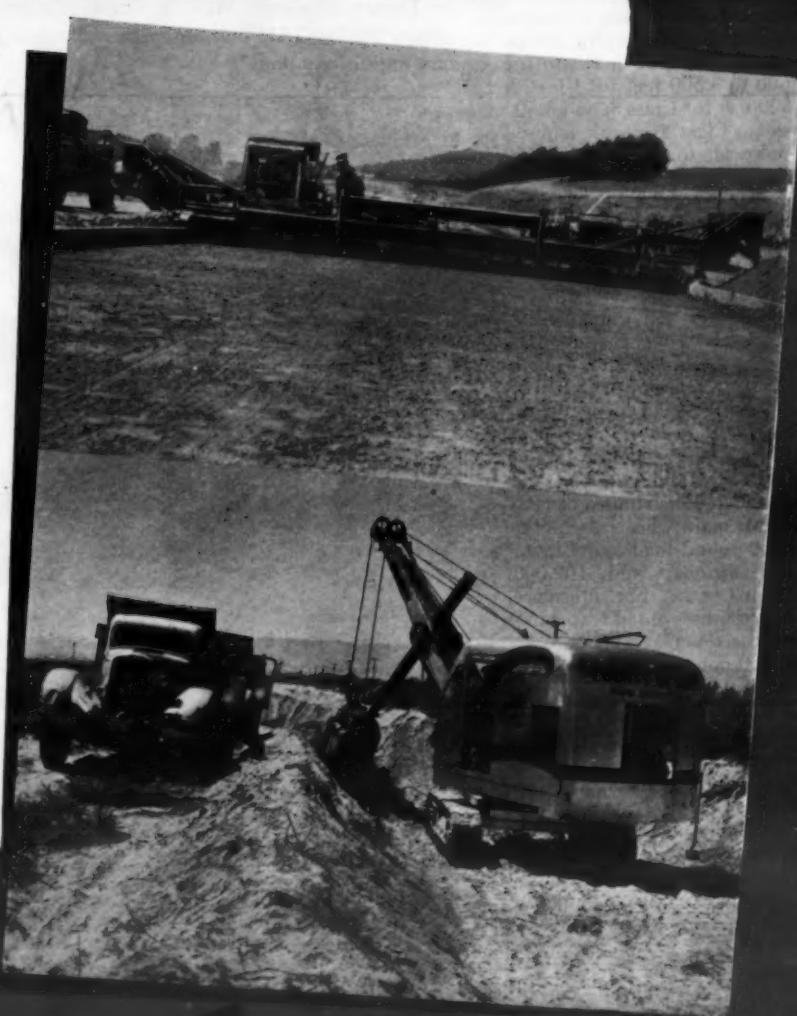
On your construction equipment requirements, it
will definitely pay you to check Buckeye first!

—mum—puts the grade *on the payline*. R-B Fine-
graders are built up to 24 ft. wide—a model for
every job.

✓ **SPREADERS** Buckeye builds the spreader with the transmission-driven spirally fluted feed roll that grips the material and distributes it accurately and uniformly right where you want it. Handles sand, chips, gravel—saves time, labor, material, money. Strikeoff attachment permits spreading up to 6 inch course of rock. Built in 9, 10, 11, and 12 foot widths.

✓ **ROAD WIDENERS** The modern way to dig subgrade widening trench. Cuts a mile or more per day—accurately. "Sparks" the whole job. Reduces loss of yield to a minimum. Built in two sizes: 16-R-2 cuts 12" to 33" wide trench up to 12" deep; 16-R-4 cuts 12" to 48" wide trench up to 12" deep.

✓ **TRACTOR EQUIPMENT** Buckeye Cable Controlled Bulldozers and Trailbuilders dig their own way in and "roll" the dirt ahead—big payload, high yardage per day. Buckeye G-L-T Hoists give lightning-fast action smoothly and evenly for faster earth moving.



Built by **Buckeye**

BUCKEYE TRACTION DITCHER COMPANY • Findlay, Ohio

Many New Airports Needed for Defense

(Continued from page 11)

Municipal Association on November 14, 1940. In referring to the recent \$40,000,000 appropriation to the Administrator of Civil Aeronautics for the construction and improvement of airports, limited to work on not more than 250 sites deemed necessary to national defense, Mr. Hinckley pointed out that a long-range plan for air facilities has been worked out. Believing that aviation is on an unparalleled up curve, it is estimated that there will be need for a system of 4,000 landing fields, requiring additional investments of more than \$550,000,000, in the next six years. This proposed system has been worked out in cooperation with the Army and Navy and includes developments in Alaska, Hawaii and the South Pacific Islands. Mr. Hinckley believes that, under pressure, this plan could be carried out in three years.

This long-time CAA plan proposes to increase the number of major civil airports from 36 to about 500; of medium-size airports from 245 to about 1,600; and of smaller fields from 1,576 to about 1,900. These are in addition to the airfields operated by the Army and Navy today.

The CAA has drawn up a set of tentative specifications for civil airports, dividing them into four classes ranging from Class 1, the small airport for communities under 5,000 population, up to Class 4, the large and completely equipped airport at large centers of population.

The recommended minimum standards for these airports include landing strips of 1,500 feet to 2,500 feet in length for Class 1, 2,500 to 3,500 feet for Class 2, 3,500 to 4,500 feet for Class 3, and 4,500 feet and over for Class 4; usable landing strips 300 feet wide for Class 1 and 500 feet wide for the other three classes; a length of runway unspecified for Class 1, 2,500 to 3,499 feet for Class 2, 3,500 to 4,499 feet for Class 3, and 4,500 feet for Class 4; and width of runways ranging from an unspecified width for Class 1, 150 feet if operated at night and 100 feet for day operation only for the other classes and a width of 200 feet if equipped for instrument approach.

No paving is recommended for the Class 1 fields, but the runway and apron paving of Class 2 fields should be able to accommodate 30,000-pound loads, the load to be considered distributed equally between the two main wheels or sets of wheels; 60,000-pound loads for Class 3 runways and aprons; and 100,000-pound loads for Class 4. For future use, 10 years hence, these load capacities should be increased to 60,000 pounds for Class 2, 150,000 pounds for Class 3 and 300,000 pounds for Class 4.

The recommended minimum facilities for the various classes of airports are drainage, fencing, marking and wind-direction indicator for Class 1; marking, wind-direction indicator, drainage, lighting, hangar and shop, fueling, fencing, weather information and office space for Class 2; Class 3 should have the

same facilities as Class 2 plus two-way radio, visual traffic control, and an instrument approach system when required; while Class 4 should have the same facilities as Class 3 and in addition an administration building.

Less than a year ago, the Airport Division of the American Road Builders' Association was organized. One of the initial projects of the Division was to invite representatives of all national organizations interested in aviation to a round-table discussion of the principles to be incorporated in legislation providing for Federal financial participation in the development of a national system of airports. Among the recommendations was that of an appropriation of \$125,000,000. As a beginning, the appropriation of \$40,000,000 mentioned above was made.

In November the CAA, which is administering this appropriation, announced that the airport construction will be handled through the offices of the District Engineers of the U. S. E. D., and that approximately \$35,000,000 of

the \$40,000,000 for airport construction will be done by contract. The work consists solely of essential grading and drainage of landing strips, paving of these strips, aprons and taxiways, and the installation of necessary lighting. Plans and specifications are on file in the various U.S.E.D. District Offices for work in that area, and bids on the first group of airports will be asked for the latter part of this month.

Highways and Defense

In modern warfare, immobile defense is practically useless. France stood behind her famous Maginot Line, believing she was completely secure, and today she is a conquered nation. Many reasons for her fall have been given but certainly one of them is that the Maginot Line counted for nothing against the combined attack of the German air force. (Continued on next page)



If you want power for tough digging—
you want speed—
you want a bigger day's work than
any similar bucket can give you—

TRY the **KIESLER**!
Digging Bucket

JOS. F. KIESLER COMPANY, 836 W. Huron St., Chicago, Ill.

There's PROFIT in that Small Job, Too!

Make small jobs, as well as larger ones, pay dividends. Reduce non-productive travel time between locations with the mobile MICHIGAN'S 25 mph. road speed. Let enthusiastic operators show you how MICHIGAN'S Air Controls increase productive time on the job! Here's fast-pace production without let-downs due to operator fatigue. Let the convertible MICHIGAN write a new story of economy and dependability into your cost records. Every MICHIGAN is built from the ground up for hard, tough going. You can handle Shovel, Crane, Clam, Dragline or Trench Hoe work with the same machine—and at a profit! Join the many MICHIGAN owners who are saying "NOW. There's PROFIT in my small jobs, too!"

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MICHIGAN America's Mobile Shovel-Crane Specialists
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COMPLETE
WELL POINT SYSTEMS
WILL DRY UP ANY
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Write for Job Estimate and Literature

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U. S. Army Signal Corps Photo

The highways and bridges in any section of this country must be adequate to carry such traffic as this without completely crippling the flow of ordinary civilian traffic.

Adequate Road System For National Defense

(Continued from preceding page)

and German motorized units speeding down the highways into France.

For this country, second only to the oceans which once made us secure is an adequate highway system to take care of speedy and heavy troop movements, to maintain lines of supplies, and to facilitate mass movements of civilians—three functions likely to be required simultaneously in an emergency. Out of the mass of confused and conflicting reports about the fall of France, one fact is definitely established, and that is that when the evacuation of Paris began, all traffic, both civilian and military, bogged down completely because of inadequate facilities to handle civilian evacuees going one way and reinforcements which were being "rushed" to the front from the opposite direction.

It is reported that one of Hitler's objectives in the bombing of London last autumn was to create such a panic in the city that a wholesale evacuation would occur, creating complete confusion on the regular arteries of traffic, and while this confusion was at its height and it was impossible to rush reinforcements from other parts of England, to land his invaders and take the capital.

The demands on our highways, for civilians or the army, in peace or in war, are no respecter of times or climatic conditions. Fast transportation may be needed in mid-winter as greatly as in mid-summer. For this reason, snow removal on our highways, to keep traffic moving steadily and safely, is an important part of a defense highway program. On page 9 of this issue, Ernst Lieberman, Chief Engineer, Illinois Division of Highways, discusses the importance of open roads in winter in preparations for defense.

Summary of Present System

Since 1921 the strategic highway needs of the nation have been the subject of cooperative study by the War Department and the Public Roads Administration. In 1922 the Pershing map was drawn up, showing all the highways then considered to be of special strategic importance, with an indication of the desired priority of improvement. For

obvious reasons, there was no announcement of this step and the map has been carefully guarded. This map and its revised version in 1935 have been a guide to the PRA in all of its work, and in approving projects for Federal-Aid funds, it has attempted to give priority to those included in this strategic system. It has also insisted on standards of design and construction consistent with use of these highways to carry the loads imposed upon them in case of war. During these years, continuous liaison has been maintained between the War Department and the Public Roads Administration in all matters affecting the planning and development of highways important to national defense.

In an address before the American Association of State Highway Officials on September 16, 1940, Thomas H. MacDonald, Commissioner of Public Roads, reported this strategic network to include the following classifications: 1. Strategic network, rural, including inter-regional routes; 2. Strategic network, urban, including extensions of the

inter-regional system into and through metropolitan areas; 3. Access roads, both rural and urban, to army camps and mobilization points, to naval bases, to rail terminals, to airports, and to industrial production areas; 4. Defense reservation roads; and 5. Tactical roads.

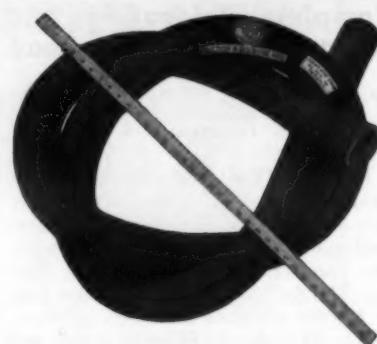
The strategic network of rural roads, Mr. MacDonald said, as now approved, totals approximately 75,000 miles of the major highways of the nation, and includes the projected inter-regional system of approximately 30,000 miles. (Continued on page 30)

THE SUCTION HOSE YOU WANT, because

It is an exclusive Goodall patented construction containing a strong steel spiral that resists collapsing under the strongest pump pulsations. If externally crushed, Newtype is the only construction which will return when hammered to its original full flow capacity. Tube and cover are so bonded that they cannot separate. Patent permits a thin hose wall so flexible it can be tied in a knot, as illustrated . . . so light your men will handle it with ease . . . nevertheless so strong it is the Contractor's first choice for Suction and Discharge lines. Sizes $1\frac{1}{2}$ " to 4", max. lengths 100' and 50'. Send for prices and details.

GOODALL
RUBBER COMPANY, INC.

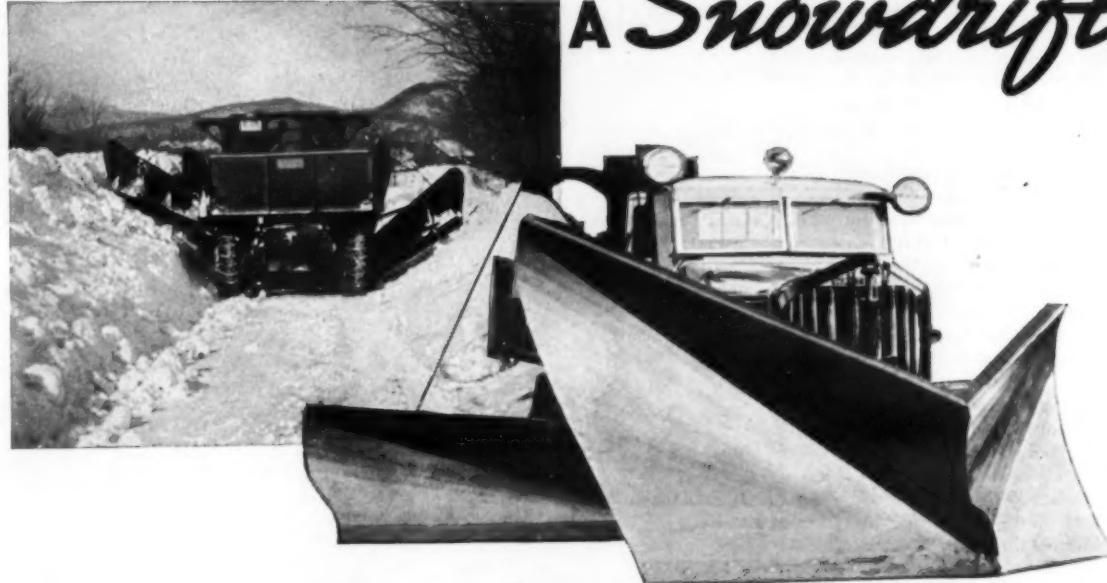
2 S. 38th St., Philadelphia, Pa.
New York, Boston, Chicago, Pittsburgh, Trenton, Houston,
Los Angeles, San Francisco, Seattle, Salt Lake City, and
Distributors.



Newtype Cord Suction and Discharge Hose,
U. S. Patent No. 1,948,410

A SLAP ON THE WRIST WON'T CLEAN UP

A Snowdrift



Just as a boxer depends on good footwork to put power in his punch, so a snow fighter depends on traction. Ramming a big V-plow into a heavy snowdrift calls for traction and plenty of it. And traction is what our unique Four-Point Positive Drive has made Walter Snow Fighters famous for, wherever winters are meanest. That is why the Pennsylvania Turnpike authorities have just bought 12 Walter Model FMD Snow Fighters to keep the new Pennsylvania Turnpike open this winter. At the same time the Pennsylvania State Highway Department has ordered 17 more of the rugged Models FBS for general snow removal, because this type has given exceptional performance in their service. And we have recently delivered to Illinois 21 Model FKML. These are only two of many states, counties and municipalities who depend on Walter Snow Fighters for heavy snow removal work. Send for descriptive literature.



WALTER MOTOR TRUCK CO.
1001-19 IRVING AVENUE, RIDGEWOOD, QUEENS, L. I., N. Y.

Heavily-Traveled Road Relocated in Maryland

Traffic Surveys Indicated Economical Solution To Be Complete Relocation and Construction of Dual Road

By EDWARD H. NUNN, Construction Engineer, Maryland State Roads Commission

U.S. ROUTE 40 from Baltimore to the Delaware state line is the most heavily traveled highway in the state of Maryland and is a part of the arterial highway connecting Washington and Boston. The daily average traffic count runs to 18,000 vehicles, of which approximately 25 per cent are heavy trucks and trailers. The alignment and grade of the existing route are such that passenger car traffic is materially slowed down, heavy operating costs are incurred by the truckers, and many hazards exist which have caused numerous accidents.

Investigations and surveys proved conclusively that the most economical solution was a complete relocation and new construction rather than to attempt to salvage any of the old roadway by relocating the sharper curves, revising the more objectionable grades, and resurfacing the remaining sections. Right-of-way costs along the old roadway would have been excessive because of private improvements bordering the existing road, which improvements would have to be removed to secure adequate width of highway.

To accommodate the volume of traffic, a dual highway is needed. The necessary surveys were made and by January, 1938, 25 miles of dual highway had been constructed and opened to traffic between the Baltimore city line and Oakington. This left a gap of 19.68 miles between Oakington, Maryland, and the existing dual highway in Delaware.

This continuation required the crossing of the Susquehanna River and going through or around the towns of Havre de Grace, Perryville, Northeast and Elkton. Consideration also was given to crossings of both the Pennsylvania and the Baltimore & Ohio Railroads, as both railroads traversed the area in which the highway was to be located. These railroads actually controlled the relocation. The two lines roughly parallel each other and fortunately were of sufficient distance apart to permit obtaining a suitable alignment for the proposed highway. The relocation eliminated an overhead crossing and an underpass at Havre de Grace and Northeast, respectively, on the existing Route 40. The objectives of relocation were the proper alignment and grade with economical construction cost, reasonable right-of-way costs, and by-passing of the business sections of the various towns while remaining sufficiently close that the towns were easily accessible to the highway.

These objectives were accomplished by the new alignment.

On the old road there are thirty-two curves, ranging from 6 to 30 degrees, and ten grades varying from 6 to 8 per cent. Sight distances under 500 feet total thirty-eight, and the minimum sight distance is 90 feet. On the relocation the maximum per cent of grade is 6 per cent, and there are nine horizontal curves with a maximum degree of curvature of 2 degrees. The minimum sight distance is 580 feet.

New Right-of-Way

A 150-foot fee simple right-of-way with an easement for the construction of slopes, waterways and other appurtenances of the roadway, was secured. The entire right-of-way cost \$256,000, an



A completed section of Maryland's new Route 40, looking east toward the Delaware state line.

average of \$13,500 a mile. The deeded 150-foot right-of-way made a taking of 334 acres of land, which taking was through farm land, wood lots, lots in sub-divisions, and in some instances houses and barns. There was a further 120 acres required for easement area for the slopes, ditches and waterways. More condemnations for rights-of-way were required in proportion to the number of properties involved than on any other construction project undertaken by the state. The fact of the great number of condemnations occasioned considerable

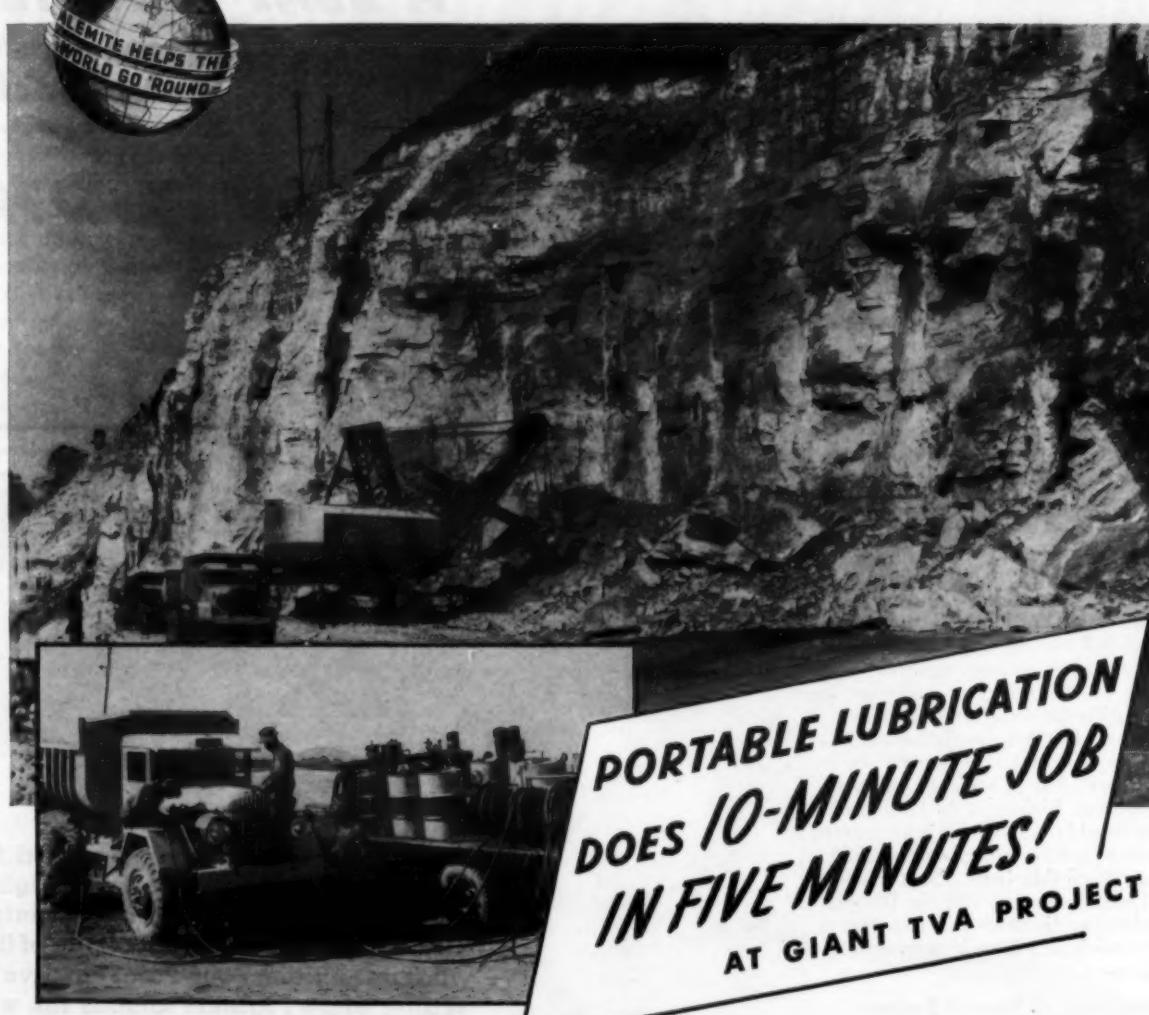
delay in starting the construction.

Design and Soil Surveys

The design of the typical section was based on a 9,000-pound wheel load, economical maintenance, consideration of future traffic demands, and pleasing appearance. Concrete pavement was selected as the more desirable surfacing. The 9-7-9-inch section was decided upon, with a parabolic crown and subgrade. Mesh reinforcement of No. 2-gage wire spaced 6 inches longitudinally and 12

(Concluded on page 41)

Ask *Anyone in Industry!*



**PORTABLE LUBRICATION
DOES 10-MINUTE JOB
IN FIVE MINUTES!
AT GIANT TVA PROJECT**

ALEMITE PORTABLE SERVICE STATIONS Bring Efficiency of Power Gun Lubrication to the Job

DOWN at Jefferson City, Tennessee, they're moving a lot of rock in the building of TVA's Cherokee Dam. Scores of dump trucks are working 24 hours a day on this project. Where minutes count, time out for lubrication means time lost from work.

With the Alemite Portable Service Station on this project, they can now completely and thoroughly lubricate a dump truck in five minutes—whereas, with manual methods, it took ten minutes. Each truck is lubricated every eight hours—that's a saving of 15 minutes per day per truck!

TVA's Alemite Portable Service Stations are equipped with two High Pressure Volume Guns, and three Motor Oil Dispensers, mounted as shown. Perhaps your particular requirements call for another set-up. We'll be delighted to make a specific recommendation if you'll write us about your equipment. We can show you records of Alemite Portable Service Stations which have paid for themselves many times over before the completion of the job for which they were purchased! Get the facts NOW!

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Dependable pumps for every purpose, ranging in size from 1 1/2" to 10". Write today for new catalog describing the complete line.

Sterling
MACHINERY CORPORATION
111 South Dearborn Street, Chicago, Illinois



The new Adams 201 grader.

New Motor Grader All-Round Machine

A new No. 201 engine-over-drive motor grader, capable of constructing and maintaining highways from bank to bank, including light backsloping, has just been announced by the J. D. Adams Co., Indianapolis, Ind. This new grader is built around the all-welded box-type main frame originated by Adams several years ago and now in use in all other Adams motor and leaning-wheel graders. This type of frame, it is claimed, offers strength and rigidity, unhampered visibility of the blade from the operator's position, and an extremely wide range of blade positions.

Fully power-controlled, the No. 201 can be operated from the operator's platform in either a stand-up or sit-down position. The circle is fully revolving and the blade can be set to ditch or move dirt with the machine operating in reverse gear. The 10-foot blade can be reversed with the scarifier on the machine simply by lifting the scarifier teeth out. The unit has five forward speeds, with a high top speed of approximately 13 mph for traveling, and one reverse speed, and is powered by an International 31-hp engine.

The wide range of blade adjustments in all directions, single rear tires and leaning front wheels permit this grader to be used on all types of surface, ditch or bank work within its weight and power range. Optional equipment includes a scarifier, canopy top, cab enclosure, starting and lighting equipment.

Literature containing more complete information on the new Adams No. 201 may be secured by interested contractors, state, county and township engineers direct from the manufacturer or from this magazine.

Roebling Appointments

Announcement has been made by the John A. Roebling's Sons Co., Trenton, N. J., of the appointment of W. K. Hanna as Manager of its Pittsburgh territory which includes western Pennsylvania and certain sections of Maryland, Virginia, West Virginia and Kentucky. Mr. Hanna has been with the company since 1919 and has recently been Assistant Branch Manager in Philadelphia.

Horace E. Thorn, who has been associated with Roebling since 1912, has been appointed Manager of the Philadelphia Branch Office to take charge of

sales and local stock of Roebling's complete line of wire rope, electrical wires and cables, cold rolled flat wire and specialties and woven wire fabrics.

Fluid Drive Applied To Air Compressors

The first application of the fluid drive principle in the manufacture of portable air compressors has been announced by the Davey Compressor Co., Kent, Ohio. This drive, which makes possible entirely automatic compressor operation, is offered as the feature of the new Davey Air Aristocrat, a machine of entirely new design in the 105-cubic foot size.

Hailed as an outstanding development in the compressor field, the fluid drive is said to eliminate all mechanical strains on both engine and compressor, thus making for more economical and efficient operation. The clutch lever is done away with and the compressor automatically begins to function at an engine speed of 200 rpm. Other new features

of the Air Aristocrat are the streamlining of the entire unit, full semi-elliptical spring mountings, and centralization of all gages and controls on one instrument panel. Every joint connection is welded to eliminate air leaks. Thermostatic heat control and a built-in tool

box are included as standard equipment.

A fully illustrated 12-page booklet introducing the Davey Air Aristocrat may be secured by interested contractors and state and county highway engineers direct from the Davey Compressor Co. by mentioning this magazine.

THE AMERICAN DELUXE CONCRETE BARROWS LOAD ACTUALLY OVER THE WHEEL

SEAMLESS STEEL TRAYS
ON ALL SIZES

WRITE FOR
CATALOG NO. 64 SHOW-
ING COMPLETE LINE OF
BARROWS, SCRAPERS,
PLOWS, ETC.



THE AMERICAN STEEL SCRAPER CO., SIDNEY, OHIO



PANEL SIDE DUMP BODY

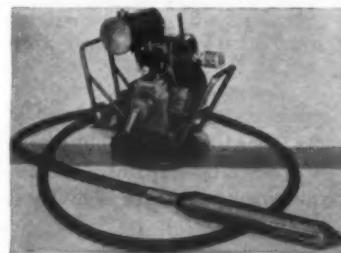
- 4.2 times as strongly braced as ordinary braced side body.
- Boxed type tail gate—Horizontally braced.
- Corrugated step plates at both ends of body.
- No seams in center of body floor.
- Excellent display sign panel.



Girder-Trussed

The new Hercules Girder-Truss Side Brace is more than 6 ft. long on an 8-ft. body. Sides are supported in the most efficient manner—AT THE TOP. When top edges of body are kept straight, there can be no spread or sag of body sides without stretching the metal itself.

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Center **LIFT** Hoist
DUMP **BODIES**



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Write for Circular on types, sizes and prices

White Mfg. Co. INDIANA
ELKHART

HERCULES STEEL PRODUCTS CO. GALION, OHIO



C. & E. M. Photo
A 12-yard Carryall working in one of the roadside borrow pits.

Heavy Rock Grading On U. S. 3 in N. H.

(Continued from page 12)

was removed to reduce an old vertical curve to improve the sight distance in accordance with the new safety requirements. Near this point a 6-inch water main was lowered about 5 feet after the pressure had been removed and just to the north 3,000 yards of ledge was removed.

Between Stas. 422 and 423 was a cut and fill section of rock with 12 inches of earth cover. At Sta. 426 + 40 is a 6 x 6-foot reinforced-concrete box culvert 125 feet long with an 18-foot drop between the two ends. This box was heavily reinforced with 27,000 pounds of steel to enable it to carry 9,600 cubic yards of fill approximately 25 feet high.

A 725-foot cut starting at Sta. 426 + 75 contained a total of 10,000 cubic yards of material running from solid ledge at the south end through wet clay and hard pan with boulders at the north end. This was followed by a particularly mean rock cut starting at Sta. 445 and consisting of 1,500 cubic yards of ledge with earth seams which made the drilling difficult and the blasting discouraging. Practically all of the material had to be blockholed after the first blast and to clean up this relatively small cut the shovel had to play five re-

turn engagements. When trimming a rock slope and cutting it back 10 feet, the contractor drilled on a 1 to 4 slope as specified but the rock had a freak stratification so that it broke on a 1 to 1 slope along a seam parallel to the road, giving an absolutely perfect break and, as all admitted, a better appearing slope.

From Sta. 460 + 50 north was a 5,000-yard sand cut with 500 yards of ledge at the bottom of the cut which measured about 300 feet in length. This was followed by 900 feet of fill requiring 25,600 cubic yards of material to give an 8 per cent grade, the maximum on the project. The next big cut was at Sta. 481 + 50 to 489, a 16,500-yard through cut 30 feet deep in sand and ideal for the 12-yard LeTourneau Carryalls. This material was carried south to the 900-foot fill. At Sta. 510 a cut 300 feet long contained boulders packed in earth. These were rooted out by the Lorraine 79 and then after a sufficient number of them had been gathered along the edge of the old road which was still being used by traffic, they were block-

holed and shot at night. Immediately south of this cut of 3,000 cubic yards a 4 x 4 reinforced concrete box culvert was installed.

"The Last Mile"

The last mile on the north end of this project where the location was changed after the contract had been signed starts off with 600 feet of shallow fill requiring about 3,300 cubic yards of material. The

relocation extended from Sta. 519 to 549, all of which was filled by a borrow of 13,000 cubic yards. At Sta. 540 some muck was encountered which was excavated and replaced with selected material.

Excavation from Sta. 543 + 50 to Sta. 546 was 5,000 yards of clear ledge. Then from Sta. 547 to 549 + 50 there was a 12,000-yard fill which was all in

(Concluded on next page)

CONTRACTORS BARROWS

with Round Fronts

Type M-11



The only barrow with tray having double folded corners and three thicknesses of steel at folds, and non-leakable

Write for Catalog 40C

JACKSON MANUFACTURING COMPANY,

HARRISBURG, PENNSYLVANIA



One of the tests that clinched the 37,000-post Super Highway contract for Bethlehem

In order to prove conclusively that Bethlehem Steel Guard Posts develop superior bearing strength, the engineers on the Harrisburg-Pittsburgh super highway required the following test:

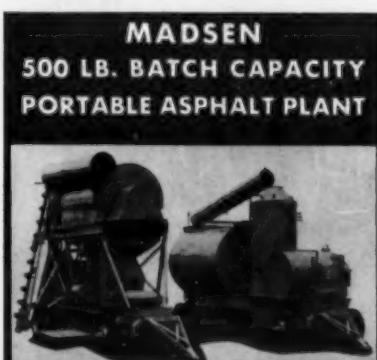
An actual "fill" on the highway was chosen as a testing site. A 4-in. Bethlehem H-beam guard post was driven to a depth of 3-ft. 5-in. A 7-in. locust post was set in a hole 3-ft. 11-in. deep and securely tamped. The two posts were then chained together and the pressure was exerted equally on each by a ratchet hoist.

This test showed that the Bethlehem Steel Guard Post had deflected only 2 3/4-in. when the other post yielded. On the basis of this and previous tests, Bethlehem was awarded 37,707 steel guard posts—every post

on the Super Highway! A tabulation of the results of the ratchet test is as follows:

| COMPARATIVE DEFLECTION | |
|------------------------|-----------|
| Steel | Wood |
| 0 | 0 |
| 3/8-in. | 2 1/4-in. |
| 5/8-in. | 3 5/8-in. |
| 1 1/4-in. | 4 1/2-in. |
| 2-in. | 5 1/2-in. |
| 2 3/4-in. | yield |

If you plan to install guard posts, consider the advantages of Bethlehem Steel Guard Posts: No holes to dig. Easier alignment. Pre-inspected by state inspectors. Designed to meet the requirements of state highway departments.



A complete mixing plant with elevator, combination dryer and screen, 4-compartment aggregate bin, weigh box with multiple beam scale, heavy duty twin-shaft pug mill mixer and incorporating the Madsen patented jack and asphalt injection system, built within 8-ft. maximum road clearance, 13-ft. 6" overall height; complete with asphalt tank and boiler unit, pumps, etc.

A complete plant in every way. Rated at 15 tons per hour; users claim as high as 32 tons per hour. The ideal plant for small municipalities and small contract work.

MADSEN
IRON WORKS
HUNTINGTON PARK, CALIFORNIA

BETHLEHEM STEEL COMPANY





C. & E. M. Photo
A Lorain 79 with an Amsco bucket rooted out large boulders in a 300-foot cut in hardpan.

Highway Relocated In White Mountains

(Continued from preceding page)

the river and carries the highway back to the old location close to the north end of the contract.

Major Quantities

The major quantities on this grading project involving much rock work were as follows:

| Item | Quantity |
|---|---------------------|
| Clearing and grubbing | 11 acres |
| Unclassified excavation | 97,000 cubic yards |
| Unclassified trench excavation | 5,000 cubic yards |
| Earth borrow | 46,500 cubic yards |
| Gravel borrow | 18,800 cubic yards |
| Fine grading | 182,000 cubic yards |
| Gravel borrow base course | 31,500 cubic yards |
| Class A bituminous surface material for tack "on gravel base" | 53,700 gallons |
| Class 2 road-mix crushed gravel | 9,900 tons |
| Asphalt cut-back for road-mix | 100,000 gallons |
| 12-inch reinforced concrete pipe | 340 feet |
| 15-inch reinforced concrete pipe | 1,700 feet |
| 18-inch reinforced concrete pipe | 252 feet |
| 24-inch reinforced concrete pipe | 140 feet |
| 30-inch reinforced concrete pipe | 48 feet |
| 30-inch extra strength r.c. pipe | 124 feet |
| 36-inch extra strength r.c. pipe | 92 feet |
| 6-inch bituminous-coated perforated-metal culvert pipe | 2,300 feet |
| Loam spread 2 inches deep | 11,500 square yards |
| Loam spread 4 inches deep | 2,100 square yards |
| Loam spread 6 inches deep | 18,000 square yards |
| Strip soil on slopes | 2,100 square yards |

Equipment and Servicing

The contractor maintained adequate equipment on the job at all times without being over-stocked. The equipment employed included four Sullivan wagon drills, one Cleveland wagon drill, two Schramm diesel air compressors, and a Chicago Pneumatic gasoline-powered compressor, a Sullivan portable compressor, a Federal truck for gas or diesel oil, a Warco grader with 12-foot blade, two International TD-18 tractors with a Gar Wood bulldozer, two Lorain 79 power shovels with 1 1/4-yard Amsco buckets, a Lorain 40, two LeTourneau 12-yard Carryalls pulled by Caterpillar RD8 tractors and eight Sterling 5-yard dump trucks. Du Pont 40 per cent gelatin dynamite was used throughout on all the ledge and boulder blasting.

In order to reduce to a minimum the loss of time due to equipment being out of service, John Iafolla maintained a stock truck with parts for all of the equipment on the job all of the time. The inside of this truck is filled with bins for the various parts and at the tail gate on one side is a mechanics' 6-foot work bench. One of the most useful

pieces of equipment in speeding up repairs was a service truck equipped with a strong derrick so that it could lift the rear end of one of the big trucks, boost a dump body to permit work on the hoist, or remove an engine entirely from a tractor or truck. A Westinghouse Flexarc electric welder was used to handle all repairs which could be made quickly by a welding operation.

The Surfacing

The completed grade with from 12 to 21 inches of gravel base course primed with 1/2-gallon of tar per square yard is being paved with a 24-foot road mix 3 inches thick compacted.

The aggregate for the road mix was produced on the job, the material being taken from the bed of the Pemigewasset River and passed through a 14 x 26-inch Acme crusher powered by a 100-hp diesel engine. It was then taken on a 79-foot x 24-inch belt through the rotary screens and washer to a 150-ton steel bin. Tailings from the crusher were passed through a 10 x 28-inch Dia-

mond portable crusher and thence back through the washer and screens. A 4-inch Carter Humdinger 400-gpm pump furnished the water for the washer. All material under 1 1/2 inches from the Acme crusher was stored in a 75-ton wooden bin for use on the gravel borrow base course on the project.

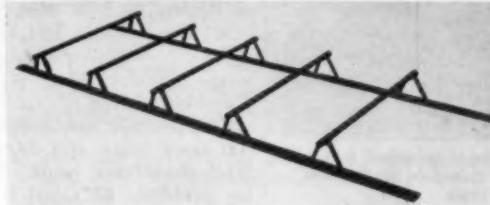
The road-mix surface course was prepared by a Jaeger mix-in-place machine pulled by a special-gearred Linn tractor.

Personnel

The contractor for FA 209-G(1) on both grading and paving was John Iafolla Construction Co., of Dedham, Mass. John Iafolla personally followed the work carefully and was represented constantly on the job by Albert San Antonio as Superintendent. For the New Hampshire State Highway Department, Charles Downing was Resident Engineer.

"For perfect bar alignment specify **TRUS-ASSEMBLY**." This is the statement being made by engineers and contractors who have used over a million feet of this unique assembly since 1938.

LOW
IN
FIRST
COST



EASY
TO
HANDLE

Economical to install—No bar alignment problems
HIGHWAY STEEL PRODUCTS CO.

CHICAGO HEIGHTS, ILL.

BIRMINGHAM, ALA.

The Hardest-Working Trucks in America!



Dual wheels and heavy duty tires as shown at slight additional cost.

FORD TRUCKS are on more jobs today than any other truck. More Fords are in use by actual registration. There are Fords in nearly all of the nation's biggest fleets. What do these facts indicate? Just this: Large and small operators are entirely satisfied with the *big efficiency* at *low cost* of Ford hauling equipment. There are Ford units for practically all America's trucking jobs. There's one for yours. Without cost or obligation, call any Ford Dealer for an "On-YOUR-Job" Test.

FORD
TRUCKS
AND COMMERCIAL CARS

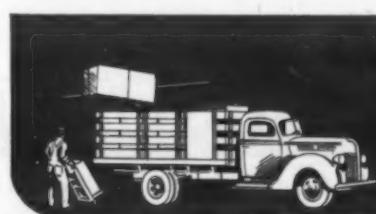
Three engines: 95 and 85 hp V-8—new 30 hp 4-cylinder economy engine for light duty. Six wheelbases—42 body and chassis types.

Penco 1869
CORRUGATED
METAL
CULVERTS

Easily installed—no delay and no maintenance. Guaranteed to meet U. S. and State Highway Specifications. Durable . . . Permanent Low Cost

Open-half or entire surface bituminous coated as specified.

Phone or write
PENN METAL CORPORATION OF PENNA.
48 Oregon Avenue, Philadelphia, Pa.





A Model 160 Buckeye trencher makes its contribution to Canada's air defense program.

Trencher Expedites Airport Drainage

With the rapid construction of airports and other defenses of vital importance to this country and to Canada, every method used to speed up the completion of this work becomes news.

At the Saskatoon airport, in Saskatoon, Saskatchewan, Canada, a Model 160 Buckeye boom-type trencher, owned by the W. C. Wells Construction Co., has facilitated digging the necessary drainage trench, enabling the tile drains to be placed with all possible speed.

The trencher readily cut outfall and lateral trench for the airport drainage system. Its ability to dig up to 12 feet 6 inches deep and from 16 to 42 inches wide made possible the speedy completion of well-graded trench for the positive carry-off of storm water from all points of the field.

The Model 160 is shown in the accompanying illustration cutting a graceful curve. Spoil, which here is being discharged to the right, can be deposited on either side and the digging bucket boom can also be shifted to either left or right.

New Truck Line

The extension of White Super Power to light as well as heavy trucks was recently announced by the White Motor Co., Cleveland, Ohio. Although Super Power was last year available only in two heavy-duty models, it is now available in a complete line from 1½ tons up in both conventional and cab-over-engine types.

Super Power trucks are designed to operate with less fuel, to provide less truck weight for greater payloads, to give more power with which to cut down road time, and to lower total maintenance costs. The outstanding mechanical features of this new line include the exclusive White six-port intake manifold, copper-lead indium-treated main and connecting rod bearings, Stellite-faced exhaust valves and seats, Wilcox-Rich hydraulic valve lifters, by-pass thermostatic cooling system, aluminum pistons, five-speed transmission and oil temperature control. Full-floating double-reduction rear axles are offered as standard on the WA-26 and WA-34 series and are optional on other models.



Complete Line
of
DERRICKS
and
WINCHES

SASGEN DERRICK CO. Chicago, Ill.

Two-speed axles are also available. All models, with the exception of the WA-34, have hydraulic brakes as standard equipment, with Westinghouse air brakes available as optional equipment.

Keeping the Turnpike Free of Snow and Ice

One of the maintenance problems on the Pennsylvania Turnpike, this country's first super-highway which extends for 160 miles through the mountains of Pennsylvania, is that of keeping the route free of snow and ice.

As a preventive for snow drifting on to the highway, the Pennsylvania Turnpike Commission has purchased and installed 300,000 feet of Mattson vertical-slat snow fence and 33,000 Bethlehem Steel snow-fence posts. To handle the ice problem, 18 Good Roads abrasive spreaders were purchased.

For its snow-removal equipment, the Commission now has 14 one-way snow plows, 10 reversible plows, both types

applicable to 11,000-pound gross-load trucks; 12 one-way snow plows for 24,000-pound gross-load four-wheel-drive trucks; 6 wing plows, 3 one-way plows and 3 V plows for 36,000-pound gross-load four-wheel-drive trucks, all made by the Good Roads Machinery Corp. In

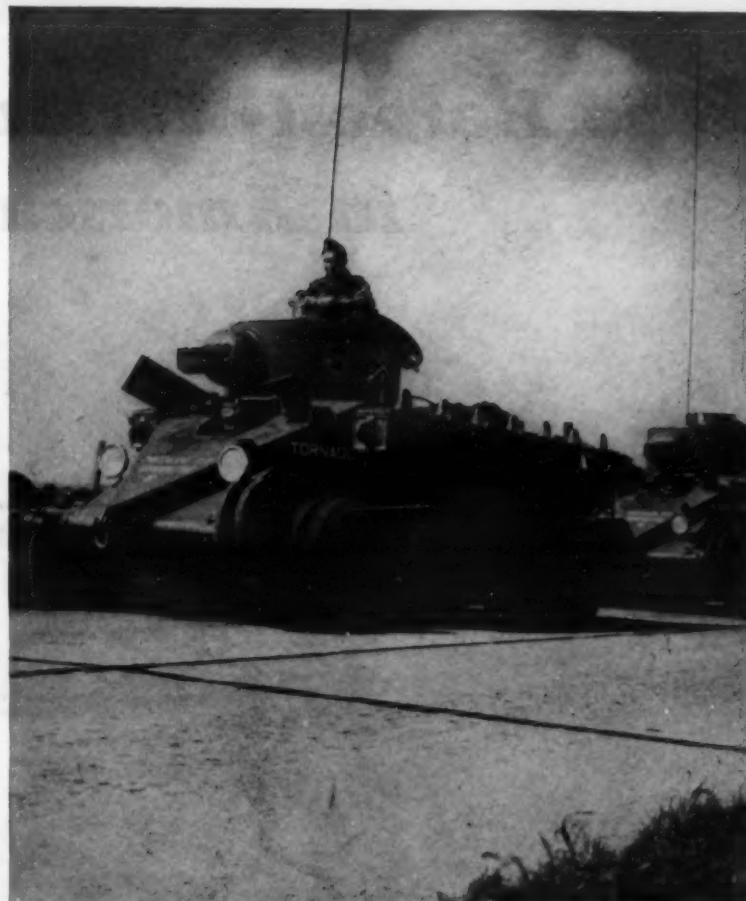
addition, 6 snow loaders, consisting of a Sargent Overhead loader mounted on a Cletrac tractor, have been purchased. Negotiations are now proceeding for the purchase of a number of rotary snow plows to round out the Turnpike's snow-fighting fleet.

INTERNATIONAL PRESSURE VIBRATION FINISHER



THE INTERNATIONAL VIBRATION COMPANY

CLEVELAND, OHIO



NATIONAL DEFENSE
calls for more speed, more special construction, more road building. Equipment must not fail. Continuous operation with avoidance of breakdowns depends largely on correct lubrication. For road construction and earth moving machinery there are...

...SINCLAIR OILS AND GREASES that offer top efficiency while helping to keep operating and maintenance costs low. No matter what make or type of construction machinery you operate, Sinclair is prepared to serve you with the correct lubricant for maximum service and economy. For quick deliveries of Sinclair products, write the nearest Sinclair office or Sinclair Refining Company, 630 Fifth Avenue, New York.

(Left) Letourneau Model "A" TOURNAPOULL — owned by the Frank Mashuda Co., and operating in Pennsylvania. This operator's equipment is Sinclair-lubricated.

Write for "The Service Factor" — a free publication devoted to the solution of lubricating problems.



SINCLAIR LUBRICANTS-FUELS

SINCLAIR REFINING COMPANY (Inc.)

2540 W. CERNAK RD. CHICAGO • 10 W. 51ST ST. NEW YORK • 1907 GRAND AVE. KANSAS CITY • 573 W. PEACHTREE ST. ATLANTA • FAIR BUILDING, FT. WORTH

New Concrete Bridge On U. S. 5 Cut-Off

**W.W.Wyman, Inc., Completes
New Black River Bridge at
Springfield, Vt., Replaces
"Horse and Buggy" Bridge**

(Photo on page 56)

THE \$113,204.00 project, FAP 135-H(1), at Springfield, Vt., constructed during 1940, shortened U. S. 5 by eliminating a loop up one side of the Black River and down the other, removed an old truss bridge and replaced it with a modern 285.66-foot overall length two-span plate-girder structure with a 24-foot roadway. The entire project was 1.162 miles in length and included considerable grading and two high approach fills to the new bridge. Also included was the relocation of 1,700 feet of the Springfield Terminal Railroad which handles passengers, freight, mail and express out of this Vermont community.

Bridge Abutments

Work on the bridge structure was started by W. W. Wyman, Inc., of Shelburne Falls, Mass., on May 6, 1940, driving wood sheeting at the north abutment and excavating 12 feet in muck. The two footings for the open abutment were then poured, ready for the 21 feet of fill behind it. A total of thirty-six piles driven to an average depth of 30 feet was required for the foundation under the footing of the north abutment.

The next work was driving the piles for the temporary construction bridge or trestle across the stream. A McKiernan-Terry No. 7 steam hammer, swung from a Northwest crane using leads, drove the piles on which were set 10 x 12, 12 x 12 and 12 x 14 timbers for stringers and caps with a decking of 3-inch plank.

Upon completion of the construction trestle the contractor excavated for the footing of the south abutment which rested on ledge some 15 feet below the stream bed.

Center Pier

The next operation was driving a steel sheet piling cofferdam slightly more than 39 x 12 feet in plan for the 36-foot

1½ inch long x 8-foot 7-inch wide footing for the center pier. The contractor made a ranger frame and then another, 6 feet above it, and loaded the box-like structure with sand bags, sinking it to the bottom in 8 feet of water. With this as a guide the sheet piling was driven in clear sand and gravel to a maximum depth of 9 to 10 feet. Then the area within the caisson was excavated to a depth of 6 feet with a clamshell while the caisson was kept unwatered from a corner sump, using a 6-inch and a 4-inch Gorman-Rupp pump.

The foundation for the footing consists of forty-two piles driven to a minimum depth of 15 feet 6 inches up to 35 feet without jetting but all of them to a 25-ton bearing, using a McKiernan-Terry No. 7 steam hammer. Then the



C. & E. M. Photo
The cofferdams were kept dry by 4 and 6-inch Gorman-Rupp pumps during excavation and concreting.

forms for the footing, which was 4 feet high, were placed and braced against the caisson. Concrete for the footing was turned out by a Rex 10-S mixer mounted on the construction trestle. The aggre-

gates were stockpiled for each pour and then weighed out on Johnson wheelbarrow scales.

The center pier consists of two col-

(Concluded on page 46)

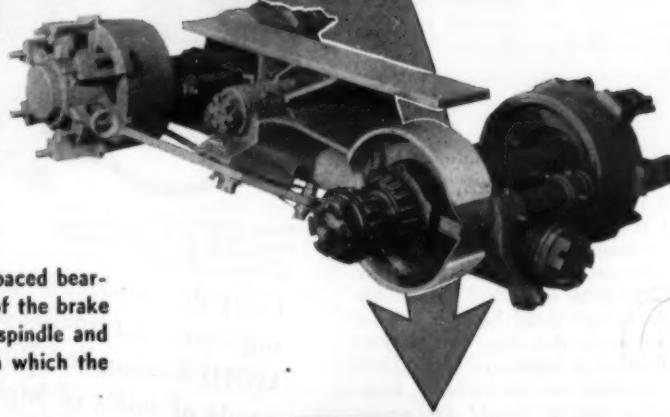
You'll enjoy **EXCEPTIONAL service**

**IF YOUR TRAILER RIDES ON
two of these
ROGERS
UNITS**

Trailer service and tire life depend upon vital parts not ordinarily visible.

Under the rear of the large trailers are two units of great importance. They must carry the load, oscillate lengthwise and crosswise, and be so designed as to keep all eight wheels in permanent alignment.

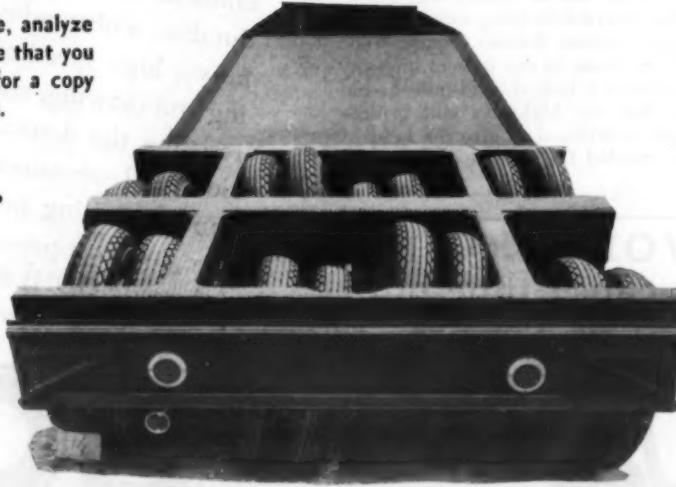
Rogers engineers have met every one of these exacting requirements in the time-tested unit here illustrated.



Note the heavy pad that supports one of the two wide-flange H sections, the well-ribbed castings of electric steel, the widely spaced bearings of the rocking members, the large area of the brake shoes, the heavy cross-section, non-tapering spindle and the two extra large Timken bearings between which the wheel load is equally distributed.

When in the market for a trailer investigate, analyze and compare. If you do so we sincerely believe that you will buy a Rogers Trailer. Meanwhile, write for a copy of the new catalog now in the printer's hands.

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EXPERIENCE builds 'em PERFORMANCE sells 'em

BURCH QUALITY



The BURCH TRUK PATROL is a new addition to the Burch line, developed by a man with many years' experience in the road maintenance field. It has many new and exclusive features and is a long forward stride over machines of that type. Full power hydraulic control, central draft bar equipped with ball and socket joint which permits a floating blade. The same front hitch used for the TRUK PATROL can be used as a front frame hitch for Ross snow plows.

Manufactured by

**THE
BURCH CORPORATION**
Crestline, Ohio
Builders of Equipment for Fifty Years

Roads for Defense

(Continued from page 23)

selected on the basis of major traffic flow lines as reported in "Toll Roads and Free Roads." The proper conception of this network is not that of the exact roads as outlined, but rather of routes which will very likely consist ultimately of several roughly parallel roads, depending upon the particular section of the country in which they are located and the possible service requirements.

The strategic urban network consists of the extensions and important connections between extensions into and through the metropolitan areas of the strategic major routes of the country. The mileage of this class is not now definite as a total, although for a number of the most important metropolitan districts a close approximation of the most necessary arteries is available. The total mileage will not be large, but the cost will be high.

Access roads consist of feeder roads and streets providing connections from the strategic network and other main roads to training camps, military and naval posts and reservations and air bases, and those serving industrial areas and plants, civil airports, railroad terminals and depots. There are approximately 2,000 miles of roads now serving military and naval reservations but outside these reservations. All roads in this category are of immediate importance, with first priority attached to those serving the training camps which will be occupied first.

Reservation roads are those within military and naval reservations, of which in September 1940 there were approximately 1,300 miles. These also come in the category of immediate necessities. Tactical roads are those within areas which will be used for large-scale training maneuvers.

The approximate cost of necessary improvements to this network is \$202,000,000, classified as follows:

| | |
|----------------------|---------------|
| First priority..... | \$121,000,000 |
| Second priority..... | 31,000,000 |
| Third priority..... | 50,000,000 |
| Total..... | \$202,000,000 |

This is, however, our absolutely minimum defense-highway requirements, and does not include the necessary mileage of good roads to take care of the increased transportation of supplies for production required by the defense program. Charles M. Upham, Engineer-Director, American Road Builders' Association, estimates that there are 100,000 miles of obsolete highways and 22,000 obsolete bridges on our primary highway system which should be reconstructed in order to bring our road system up to actual defense requirements.

The weakness in our present highway system is not a lack of road mileage but rather that our highways and bridges are not conditioned to give the kind of service needed for defense—in fact, in

many cases, it is entirely inadequate for ordinary civilian traffic of the present day. Hon. Wilburn Cartwright, Chairman of the House Committee on Roads, has stated that at every hearing of the Committee on Roads for the past 10 years, highway officials, both state and Federal, have been practically unanimous in emphasizing and urging the modernization of the many sub-standard portions of the existing system of main highways, and it is work of this type which constitutes the greater portion of the strategic-highway program.

What Happened in Texas

The Army maneuvers in Texas and Louisiana last summer provided the Texas Highway Department with an opportunity to study the adequacy, or lack of it, of some of its roads for national defense purposes. A report by Commissioner Robert Lee Bobbitt indicates that 75 per cent of the roads used in the maneuvers were inadequate to carry the traffic, even the very light type of motorized equipment used.

Army authorities and the highway department collaborated in working out the routing of the troops to the training area. In a number of instances it was necessary to use longer routes in order to accommodate the heavier equipment. Many of the bridges and culverts were totally unable to carry the loads, and it was necessary either for the trucks pulling artillery to be unhitched, driven over by themselves and the guns pushed over by men, or to build detours which during rains became impassable. This, in an emergency, could well be fatal.

In addition, there was considerable disturbance to normal traffic, although traffic in that area is generally light, probably averaging less than 200 vehicles a day on the roads involved. However, under actual war conditions, this disturbance would have been critical.

The damage done to the highways in Texas as a result of this army traffic was so great that it cost the Texas Highway Department \$140,000 for extraordinary maintenance repairs to put the roads in

(Continued on next page)

FORM WORK AND
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ARE SYNONYMOUS

Practically every
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NEW YORK'S
CIRCUMFERENTIAL
HIGHWAY

is Richmond-Tied

See "Sweet's" 3-51.

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Meets copper-bearing pure iron requirements in all specifications published by nationally recognized specifying authorities.

Every day, under all types of roads, meeting every imaginable drainage condition, GOHI Corrugated Pipe safeguards thousands of miles of highways. Strong and durable; withstanding the punishment of heavy, high speed traffic, alternate freezing and thawing, and shifting, heavy fills; resisting the destructive action of corrosion and abrasion, GOHI Corrugated Pipe is writing new records of trouble-free, low-cost-per-year performance. This is because GOHI Pure Iron-Copper Alloy — the finest ferrous culvert metal pro-

duced — is used in every GOHI Corrugated Pipe. Ask any of the fabricators listed below for full details.

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A copy of this 72-page book containing valuable data, charts and tables on the use of GOHI Pipe in modern drainage practice, is yours for the asking. Address the fabricator nearest you.



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Connecting Bands . . . Shapes
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WON'T QUIT
or cause time out



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

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Hayward Buckets

Roads for Defense

(Continued from preceding page)

condition for normal traffic after the maneuvers were completed.

This is an example of the problem to be faced in preparing our highways for actual defense in an emergency.

Requirements for Military Roads

The standard requirements for military highways include a hard surface which is capable of supporting a 9,000-pound wheel load on pneumatic tires; a minimum width of 20 feet; a maximum grade of 5 per cent in lengths greater than 500 feet in non-mountainous areas, and in mountain regions a maximum grade of 8 per cent in lengths greater than 500 feet. In non-mountainous areas, a maximum curvature of 6 degrees is allowed, and in mountain areas, a maximum of 14 degrees. The sight distance in non-mountainous areas should be a minimum of 1,000 feet, and in mountain regions, a minimum of 650 feet. Bridges should have an H-15 load capacity, a vertical clearance of 14 feet minimum, and should be 4 feet wider than the approach roads.

The structural requirements of these minimum military needs correspond closely to those which have been accepted as a minimum to meet civil highway transport needs. The 9,000-pound wheel loading for road surfaces, provided the traffic is carried on pneumatic tires, is in line with the capacity of standard highway pavement, and the H-15 specification loadings, adequate to carry all military loadings which have been proposed up to the present time, have long been standard for rural bridges.

Work Urgently Needed

In a special statement to CONTRACTORS AND ENGINEERS MONTHLY on needed highway work for defense, John M. Carmona, Administrator of the Federal Works Agency says:

"The Federal Works Agency has provided many improvements desired by the War Department as strategically important for defense, and such work constitutes a large part of the present program.

"The conditioning and strengthening of a 75,000-mile strategic network for both normal peace-time service and defense use seemed last June to be the most



Texas Highway Dept. Photo
Highway No. 21 in Nacogdoches County, Texas, showing the damaged state of the road after the Army maneuvers last summer.

important road work ahead of us. But since then, Congress has provided for mobilization of the National Guard and conscription of young men for military training, and sites have been selected for new defense industries. Immediately these developments created an urgent need for access roads to provide ade-

quate connection for the new and enlarged military camps and for new and expanding factory communities with main highways.

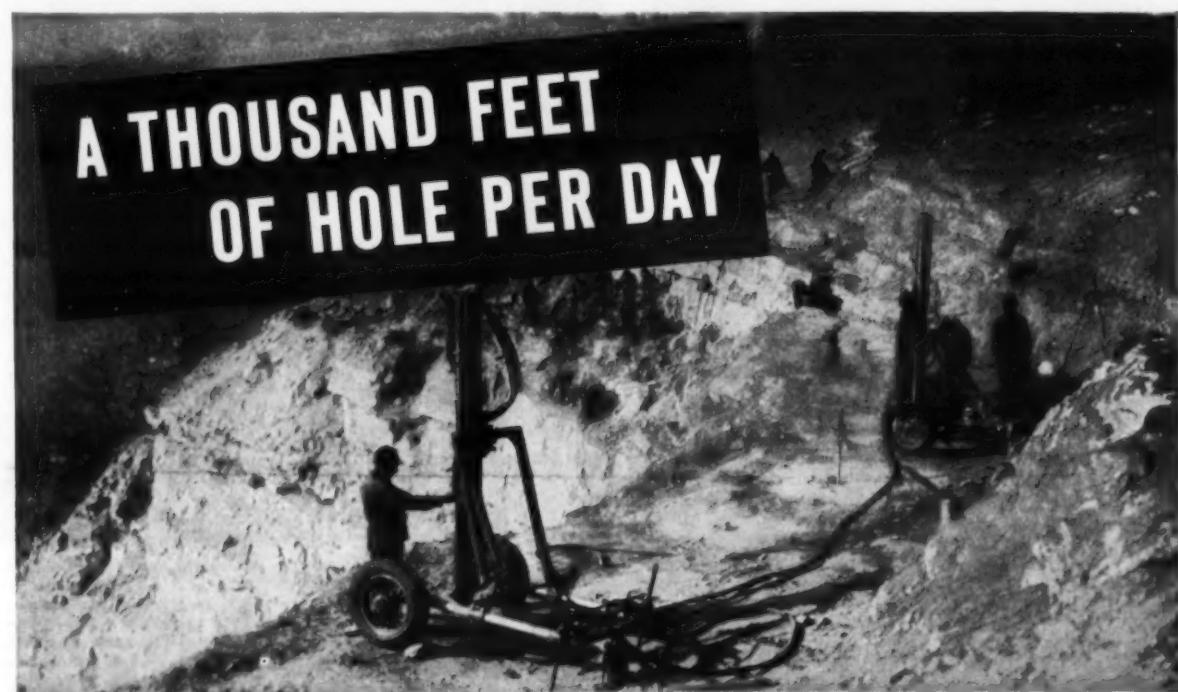
"The construction of access roads has great immediate urgency, and is being given first consideration. Preliminary estimates indicate that Army and Navy

establishments alone need 2,900 miles of access roads and that these improvements will cost about \$194,000,000. The job of planning these access roads is already under way. The Public Roads and Work Projects Administrations are cooperating with the War Department to determine the specific access roads and streets needed at the site of each military establishment and defense industry, the approximate cost of these improvements, and the money available from different Federal, state and local agencies for construction.

"Money available for this rush job of access-road construction includes:

"1. Regular Federal-Aid funds now apportioned to the states and not yet obligated for construction, totaling about \$198,000,000 for the Federal-Aid system, about \$38,000,000 for secondary or feeder roads, and about \$68,000,000 for grade-crossing elimination. Under the Federal-Aid plan, the highway funds are matched by state appropriations but grade-crossing funds are not.

(Continued on page 38)



Cleveland DR8 Drill Rig is the favorite on this quarry and road job along "Ole Man River" near Alton, Illinois

★ Fifty 20-foot holes is no uncommon feat for this famous Cleveland DR8 Drill Rig. With its powerful D14DR drifter, automatic feed, quick return and quick steel change, with pneumatic tires to facilitate moving from hole to hole, and the novel recoil device which insures that no hammer blows go to waste, this Cleveland Wagon Drill is daily hanging up new records of footage and economy of operation.

The DR8 can be quickly set to drill at any angle, in any direction. Patented steel centralizer and the exclusive forward leg point insure that you'll have no stuck steels. Hole blowing blast keeps the cuttings away from the edge of the bit, makes certain that you won't need a blow pipe. You can't afford not to try out the Cleveland DR8. We will arrange the details. Just give us the word.

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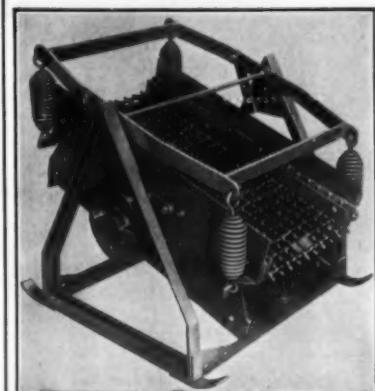
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An easy-to-move, completely set up unit that requires very little power (2-hp. gas engine or 1-hp. electric motor). Separates into three sizes of material accurately. 100 tons capacity per day. A money-saver on road and construction jobs, at small quarries, factories, concrete block plants.

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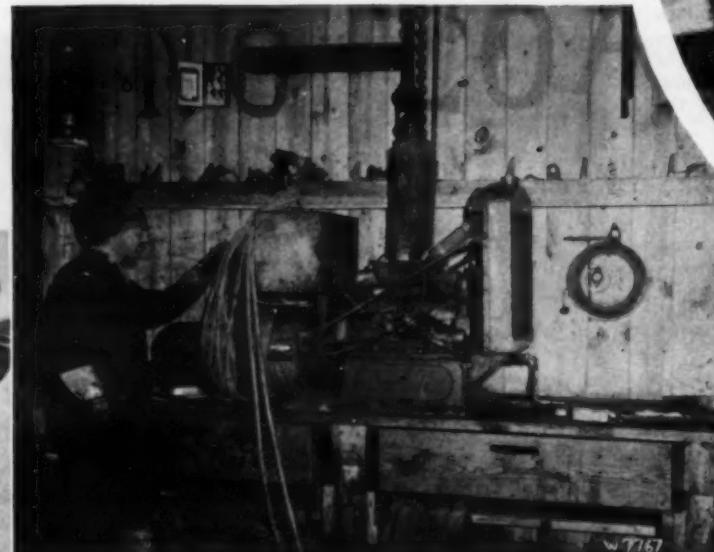
LEADERS IN DRILLING EQUIPMENT



SMASHING THROUGH on a Kootenai County road in Idaho, clearing from 1 to 20 miles a day, with an International TD-35 tractor and an Isaacson V-type snow plow.



COMBAT Engineers using an Allis-Chalmers tractor and a Hough shovel to build an ammunition road during the Second Army maneuvers. This is a demonstration of the value of construction equipment to troops in action.

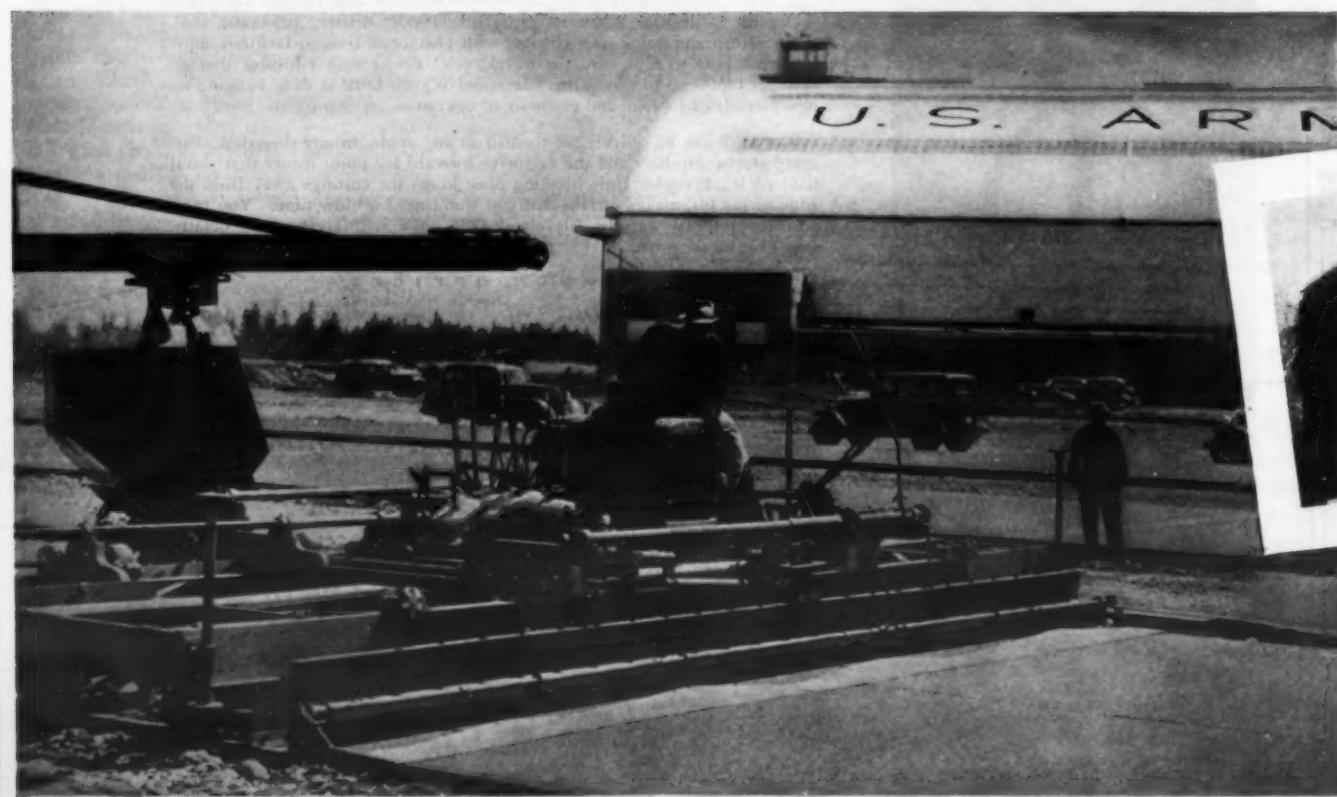


QUICK REPAIRS to equipment in the field are made by Ferguson & Edmondson Co. of Pittsburgh, Penna. Worn grousers on crawler treads are repaired by welding a $\frac{3}{8}$ -inch round hot-rolled stock bar to the medium-carbon grousers, using one bead on each side. After a month of service, when the bars become flattened, a bead of Abrasoweld is applied on the top to prolong the life of the grouser. Above, the head welder is setting the ground control on the 200-ampere Lincoln arc welder.

Little *w*
arrives in full control of the situation. The
20-months-old son of a Turnapulver
extend our



TOUGH GUMBO moved by *man*
inch belting to
outfit, owned by Taylor County, Iowa, a *wa*



ARMY AIR FIELD. Adding its contribution to the national defense program, this latest model Flex-Plane Panama-type finishing machine, powered through a V-belt drive by a Waukesha 4-cylinder 27½-hp engine, and equipped with four electric vibrators, was used in paving at McCord Field, Fort Lewis, Washington, where vast improvements are being rushed to completion. The contract for 135,000 square yards of concrete paving aprons was awarded to the Northwest Construction Co. of Seattle, Washington.



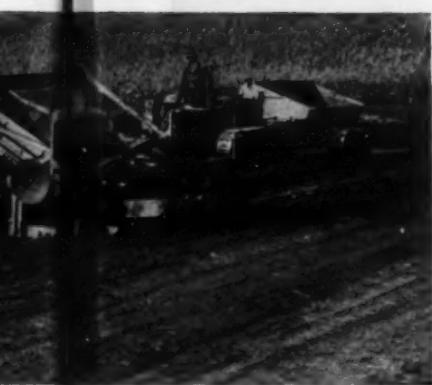
EVUTI
of *build*
Missouri pro
ing *co*
bridges an
span *in*
1,500 *ba*
tyrannu

Mc



Little New Year

The site of the guine of Edward Dennis Beebe, Arapahoe, Colo. Joining with little "Butch," we end our tales for 1941.



Moved by Mams No. 11 elevating grader with 48-inch belt, up to four 8-yard Euclid wagons. This, Iowa, wagon a minute.

EVOLUTION
of bridge building in
Missouri, progressing
from a covered
bridge on an old
narrow truss
span to a modern
1,500-foot bascule
structure.

Missouri Dept.



DEFENSE against snow-blocked roads in Iowa. The State Highway Commission uses this Davenport-Prink Sno-Plow in Scott County to keep the highways, the life lines of commerce, open during the winter months.



COMIN' ROUND THE MOUNTAIN. U. S. 99 South of Siskiyou Summit, below Ashland, Oregon, just as work was started on a 2.4-mile relocation contract, and right, after the 600,000-cubic yard grading operation was completed by Roy L. Mouck, of Salem, Oregon, contractor for the project. Such jobs as this are all part of the important plan for adequate defense highways but in order to make this country secure, we must have many more of them.



URBAN SUPER-HIGHWAY. The completion of the Lower Saw Mill River Parkway in Westchester County, N. Y., facilitates the flow of traffic to and from New York City.



TEMPERATURE GOING UP! The quick boosting of the temperature of bituminous material in tank cars is required for speedy loading. Brown & Root, Inc., highway contractor of Houston, Texas, used this Grace Rapid-Fire tank car heater at Conroe, Texas, to heat Texaco OA-135 asphalt to 360 and 380 degrees for a Montgomery County highway job. Modern equipment which speeds up work will contribute a large share to construction for national defense.

State Highway Crews Fight Big Blizzard

(Continued from page 16)

caused some of the shallow cuts of about 4-foot depth to fill in practically even; and it appeared that the natural slope of the snow drifts was more like 50 to 1 than those usually assumed to be sufficient in designing backslopes for snow control.

Many People Trapped

Due to the fact that thousands of people had taken advantage of the weekend holiday, there were an unusual number planning on traveling the highways in the afternoon and evening of November 11 in order to get back from their outings. Many of these, in spite of developing storm conditions, attempted to make the trip, with the result that they had to stop eventually at any available shelter, such as farm houses, roadside taverns, filling stations, etc., where in many cases they were confined for two days before they could get out. Some lives were lost by people freezing to death on the highways or being gassed while sitting in their cars, but in most cases the deaths could have been avoided if these people had accepted the offers of shelter and help that were extended to them before the storm got too severe. Many hunters lost their lives, but this happened on the hunting grounds where they were caught by the storm and could not reach points of shelter and safety. Much rescue work was carried out with highway department equipment during the night of November 11, when the storm was at its height.

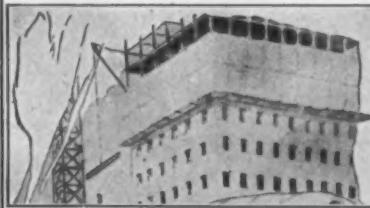
Delays to Traffic

Considering the time that traffic was prevented from using the highways due to storm conditions, there was on a whole not much delay to traffic on account of closed roads. Commercial traffic was prevented from using the highways quite largely during November 11 and 12 on account of storm severity, while blocked roads prevented extensive highway use for about 12 hours following the storm, but as most of this was during the night of November 12-13 the consequences of this delay were not serious.

The severe wind began to subside during the closing daylight hours of November 12, and by 9:00 o'clock the following morning, 7,300 miles of roads were available for use with at least one-lane openings through the heavy drifts. The balance of the mileage was opened up rapidly and thereafter widening and clean-up operations were carried out, so that within one week after the storm, all of the mileage of major importance and most of the mileage of lesser importance was back to normal service condition.

WHO STOPS—
when you're building a
defense project—
YOU OR WINTER?

WORK CAN GO ON BEHIND CANVAS



WITH PARA WATERPROOFED
WINDBREAKS
MFD. BY
H. WENZEL TENT & DUCK CO.
ST. LOUIS, MO.
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A 7-ton all-wheel-drive truck plowing its way through a snow bank in Minnesota after the record blizzard of November 11, 12 and 13, 1940.

Equipment Used

The equipment used for opening the roads consisted of everything from light trucks to heavy 10-ton all-wheel-drive trucks, special rotaries, and motor graders. The biggest problem was the extreme depth of snow that accumulated in deep cuts, behind groves of trees, etc., where the strong wind would naturally drop its snow. These extreme

accumulations in many cases had to be opened up by hand shoveling or by rotaries, since even the biggest type of V-plow and truck was unable to get through. The snow was extremely hard to handle, due to the fact that it was wet, heavy and water-logged next to the roadway. As soon as the snow was removed from the road, the water froze and caused heavy, slippery going.

Method of Attack

The general plan of operation was first to open one-way roadways through all the drifts. This was accomplished in some cases by lighter units accompanied by shovels; by heavier units smashing their way through the drifts by impact; and rotary units cutting through drifts in the usual manner. Each piece of equipment operated out of its home point, of which there are 288 in the state, and the number of units in action was in excess of 500. As soon as traffic lanes were "holed" through, clean-up operations started, using one-way plows on trucks; motor graders mostly for blading compacted snow and ice from the road surfaces; heavy-duty trucks winging back the lesser snow accumulations; and rotaries widening out the deep snow accumulations. Fortunately, mild weather followed the extreme storm. This facilitated the removal of ice and frozen snow from the road surfaces, but hampered to some extent the removal of high banks which became water-logged.

(Concluded on next page)

AVERRAGING 1,000 TONS A DAY



... of one
inch mat



Equip yourself with complete information. The whole story is in the Barber-Greene Finisher Booklet. Send a card or letter for your copy. There is no obligation.



IT takes systematic organization to lay 1,000 tons of 1" x 22' mat any day. But to average 1,000 tons a day for 31 miles of the most beautiful sand asphalt you have ever seen, perfectly leveled, and uniformly compacted, takes more than organization and good intentions—it takes Barber-Greene Tamping-Leveling Finishers.

The State of Georgia is using two of its Barber-Greene on this two course job from Jesup to Nahunta, not only proving the excellence of Barber-Greene pavement and the economy of B-G operation, but the way in which Barber-Greene set the pace for the whole project.

40-13

BARBER **GREENE**
AURORA ILLINOIS

Unusual Problems In Minnesota Storm

(Continued from preceding page)

and heavy because of the thaw.

Sanding Operations

It has been the general policy of the Department to sand hazardous places, such as hills and curves, but the suddenness with which this storm struck and the rapidity with which the rain changed to snow and the water on roadway surfaces changed to ice made it impossible to accomplish any sanding in advance of or during the storm. It naturally followed that vehicles attempting to drive the highways during the high wind were in many cases blown off into the ditches, and in a few cases collisions occurred when passing vehicles were blown into each other's path.

Unusual Conditions Prevailed

While much study and attention have been given to taking care of traffic during winter conditions, and operating policies have been set up to provide satisfactory roadway service as far as possible, practically all policies became inoperative during this intensive storm; and about the only thing that could be done was to get the people off the highways and stand by until the storm blew itself out. Attempting to carry traffic under conditions which were experienced in this storm would be just about as sensible as trying to operate boats over usual routes during an extended tornado. The Department has found, as a result of this experience, that more attention should be given to warning traffic adequately and emphatically. With the data now available from weather stations gathering information for air-lines, it is possible to anticipate the time, the nature and the severity of storms; and with the generous and free cooperation of radio stations, this information can be broadcast whenever necessary.

Another handicap the Department was confronted with was the fact that many telephone lines were put out of commission by the storm. This, combined with the immense volume of distress calls that were placed by people trying to communicate with each other, made it practically impossible at times to get calls through on the telephone lines that were in service. The Department expects to discuss with the telephone companies the possibility of securing right-of-way over all other calls during severe storm periods, so that important information can be transmitted to operating forces throughout the state, and the public be kept informed as to what the situation is. Excellent cooperation was extended by the radio stations in broadcasting frequent bulletins issued by the Highway Department. In some cases where telephone communication was not available, communication was effected between highway control points by means of "ham radio operators" who offered their services and transmitted the communication either by local telephone or by messenger.

It is impossible to estimate the extent of damage caused to private vehicles through collision, upsetting in ditches, freezing, etc., but it would be safe to say that this amounted to thousands of dollars. An indication of the severity of the storm might be given in pointing out that hundreds of thousands of dollars of loss was suffered by farmers and poultry raisers in many areas, where large flocks of poultry and thousands of head of livestock perished. Ordinarily cattle and horses can withstand quite severe weather, but in this case if the animals were unable to find shelter and were caught by the storm, exposed



In many cases, Minnesota's heaviest trucks and plows could not buck the drifts singly. Here a Walter diesel-powered Snow Fighter is hitched in tandem to the truck in front. With this double-barrel shot, they broke through the heavy drifts.

in fields and pastures, they were found frozen to death. The storm conditions were so severe that the owners did not dare to venture out to rescue them.

While records disclose that no storm of equal intensity has crossed the state in a period of some 60 years, nevertheless all phases and circumstances of

the recent storm are being reviewed and studied so that similar emergencies can be handled to better advantage in the future if required.

Defense against wear and breakdowns of equipment is also vital. Proper, regular lubrication helps.

New Locking Nut

A locking nut which can be tightened up or backed off part way long after its application, or taken off and reapplied many times without losing its gripping power on the bolt, is made by Security Metal Products, Inc., 368 East Kalamazoo Ave., Kalamazoo, Mich.

The bolt gripping element of this Security nut consists of a slightly elliptical shaped spring-steel retainer permanently seated in the head of a standard nut. When the nut is applied, the retainer is distorted from an elliptical into a circular shape, thus setting up a powerful spring pressure between the bolt threads and the retainer threads. Neither threads are injured when applying or removing.

The nut is started on the bolt with the fingers, like a standard nut, and then a wrench is used when the threads of the retainer start to engage the threads on the bolt. This Security nut fully meets the thread-pitch tolerances of the National Screw Thread Commission.

Study This Record of Profit-Making

FIRSTS

They Have Shown the Way to Profits to Hundreds of LeTourneau Users

LeTourneau equipment is built for you by specialists in tractor-drawn earthmoving units. R. G. LeTourneau, chief designer and founder of the company, was a tractor operator and then big-time contractor long before he began manufacturing. Most of the company's executives, engineers, plant superintendents, district representatives and servicemen were tractor operators, contractors, earthmovers before they came into our plant. We feel safe in saying that no other manufacturer of earthmoving equipment today has so many key men with actual, on-the-job experience. To keep this experience fresh LeTourneau bought 20,000 acres of hilly land at Toccoa, Georgia, and established a plant there, where we move several hundred thousand yards of earth each year while experimenting with and proving new equipment. No other tractor equipment maker has such a vast test

ground. Result; we approach your earthmoving problems from a practical standpoint, know instinctively how to avoid the headaches of faulty and impractical designs, consistently come up first with new, money-saving improvements.

R. G. LeTourneau and his first self-propelled, self-loading scraper, 1923.

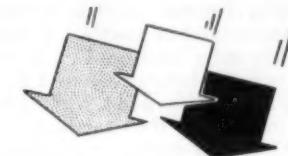


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1st scraper to dig, carry and spread

1st full cable-controlled scraper

1st positive-ejection scraper

1st pneumatic-tired scraper

1st with electric, arc-welded, all-steel construction

1st with box-beam construction

1st with mechanical reeving by doubledeck sheave assembly

1st to operate tractor scrapers in tandem

1st double-bucket scraper

1st with scrapers above 12-yard capacity

1st to promote giant tires for greater flotation

1st double-bottom scraper

1st to hard-face scraper cutting edges

1st slide-out dump trailer

1st tractor wheel crane

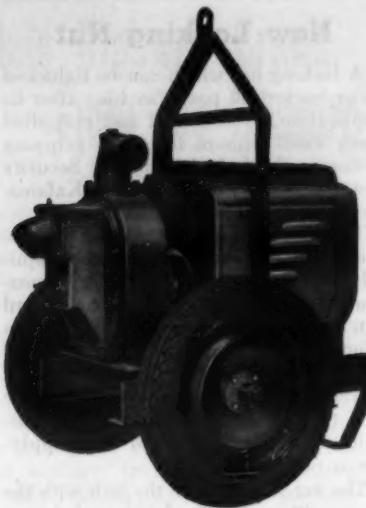
1st to certify tractor-scraper operators

1st large self-propelled, self-loading scraper

Many of these features have since been imitated by others, but only from LeTourneau can you get them all . . . job proved by hundreds of users. To assure yourself consistent profits, progress with the pioneer—LeTourneau. Your LeTourneau—"Caterpillar" dealer will gladly show you the latest cost-cutting improvements—see him TODAY.

NOW—the fast-moving Model C Tournapull.





The new Marlow 4-inch 30M self-priming centrifugal pump.

New Self-Priming Centrifugal Pump

A new 4-inch Model 30M self-priming centrifugal pump, rated at 30,000 gpm and guaranteed to handle a 25-foot suction lift and a total head up to 90 feet, has recently been announced by Marlow Pumps, Ridgewood, N. J. This new unit meets all the standards of the A.G.C. and carries an A.G.C. nameplate.

This new pump is equipped with a Marlow special self-adjusting shaft seal, with the hand-hole plate on the suction passageway allowing access to the pump chamber on the suction side for removal of trash without stopping the engine and without losing the priming water. The interior of the pump is easily accessible by removing the front cover plate.

Power for the Marlow 30M is furnished by a 4-cylinder Model D-71 La Roi air-cooled engine. The standard mounting is on two 24-inch diameter x 4-inch steel wheels, with two 26-inch diameter pneumatic-tired wheels available at extra cost. The towing handle, which is swivel mounted, can also be used as a lifting hook.

Further details on this new Marlow pump may be secured by those interested direct from the manufacturer.

Absorbent Form Lining Case-Hardens Concrete

Recent tests of absorbent form lining on a concrete dam have shown certain distinct values in its use and some disadvantages which must be taken into account by engineers specifying the use of this type of material and by contractors working under these specifications.

The theory of and claims for absorbent form linings are that they give a smoother surface to the concrete, they produce a harder surface by actual test, and they remove air pockets and the markings of excess water running down between the concrete and the forms. All of these claims are true and have been confirmed by recent fairly large-scale tests under careful supervision.

Offsetting these advantages to some extent are the cost and the difficulties of handling these new materials. The materials thus far developed are much like large thick sheets of blotting paper and they add about 5 cents per square foot to the cost of form work. Care must be exercised in handling the material lest it crack in placing, thus eliminating the smoothness factor mentioned as an asset. When the forms are removed, a considerable portion of the porous lining sticks to the concrete, requiring high-pressure hosing or hand-scraping to remove it. Thus the absorbent material can be used but once.

The advantages in the removal of air bubbles are very real on battered faces of walls or dams, but not as great on vertical faces. The case-hardening effect

combined with smoothness are of great value on the faces of dams or spillways. Thus we are faced with a new type of material which has characteristics possible to evaluate, and in those places where the gain, in appearance and strength are worth the added cost we can make economic use of the new materials supplied.

Slide Rule Simplifies Control of Distributor

With a new computing slide rule for operators of Etnyre Black Topper bituminous distributors, control of these machines has become so simple that even a child can operate them, according to E. D. Etnyre & Co. Not only has operation been simplified, but all guess work on the part of the operator is said to have been removed, resulting in accurate control of every phase of distribution.

For convenience and to reduce the overall size of the slide rule, the Com-

putator has tables on both sides. By following the instruction sheet and using the specially designed slides, it is possible to determine quickly the bitumeter or tachometer settings for spray-bar lengths of from 3 to 30 feet, the material required for application up to 3 gallons per square yard, and the solution of any multiplication, division or percentage problem.

Printed on heavy toughened card-

board, precision die-cut for accuracy, and hot-press laminated with heavy cellophane, the Computator is durable, highly resistant to finger smudges, and easily cleaned off. As an added protection, it has been placed in a sturdy envelope jacket for carrying in vest, coat or overall pocket.

The Computator may be secured for \$1.00 direct from E. D. Etnyre & Co., Oregon, Ill.

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Low Power Costs and Upkeep.
Complete Safety

Bronze or Roller Bearing JAW CRUSHERS

Heavy Armor plate steel or cast steel constructed. Large capacity. Small power requirements. Many sizes built—stationary or portable to meet your requirements.

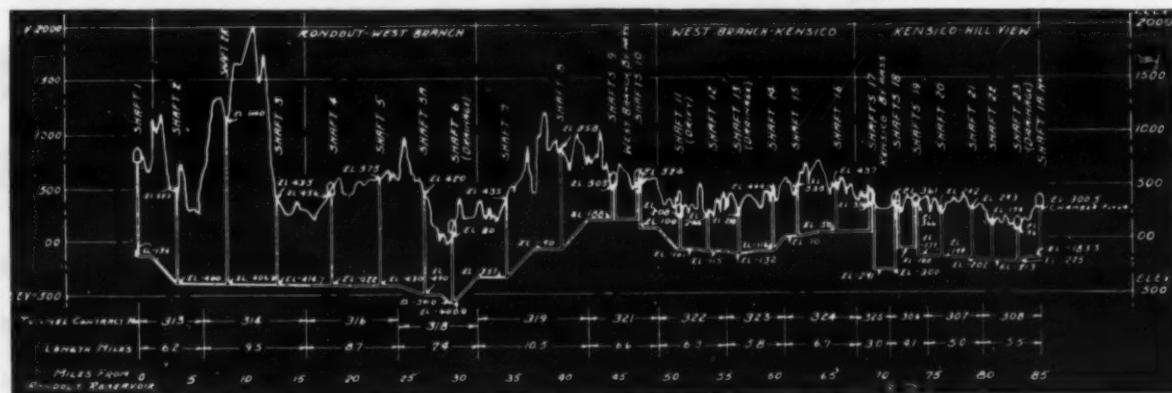
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Correction!
GARDNER-DENVER AF-99 DRIFTERS USED ON
~~37.8%~~ **37.8%** OF ALL HEADINGS ON THE
DELAWARE AQUEDUCT



GARDNER-DENVER AF-99 AUTOMATIC FEED DRIFTERS ARE DRIVING MORE THAN ONE-THIRD OF THE HEADINGS

Total length of tunnel . . . 85.42 miles

Being driven by Gardner-Denver AF-99 Drifters . . . 25.50 miles

Percentage of headings equipped with Gardner-Denver AF-99 Drifters . . . 37.8%

RECENTLY we told you that powerful Gardner-Denver AF-99 Drifters were in use in 32% of the headings on the Delaware Aqueduct job. Added installations of AF-99's have since increased this figure to 17 headings of the 45—or 37.8% of the total.

What's more, these drifters were used in four more headings than competitor A, in six more than competitor B, and thirteen more than competitor C! Here is the Gardner-Denver "Acceptance Chart," which tells the story of preference:

GARDNER-DENVER—17 HEADINGS

COMPETITOR A—13 HEADINGS

COMPETITOR B—11 HEADINGS

COMPETITOR C—4 HEADINGS

Other Gardner-Denver equipment that "led the parade" on the aqueduct are the sharpeners, which predominate four to one—and the grout pumps which are ahead three to one!

Write us today and learn—in detail—why Gardner-Denver AF-99 Drifters are used on so many major tunnel jobs. Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

**SINCE
1859**



The new Osgood Mobil-Crane.

New Type of Crane Completely Mobile

In developing its new Mobil-Crane, the Osgood Co., Marion, Ohio, believes it has made a definite contribution to the demands of modern industry for greater speed and mobility in material-handling equipment. This new one-man one-motor pneumatic-tired unit is not a truck crane, but is mounted on a pneumatic-tired truck frame, operated by one man and powered by one motor. It will travel in a storage yard wherever an industrial truck will go. It has four speeds, forward and backward, and will lift and carry loads up to 15 tons, and swing its load in a full circle. Speeds up to 5 miles an hour with its load can be obtained.

Steering is accomplished by hydraulic control, and the machine may be turned in a 50-foot radius. Front and rear wheels are equipped with air brakes of the internal expanding type, affording maximum safety when traveling on the highway, according to the manufacturer. The tandem rear wheel assembly is mounted in a large bearing bolted to the frame, and has a knee-action effect when traveling over obstacles. This keeps the upper body level at all times, and relieves the frame of twisting strains.

Additional information on the new Osgood Mobil-Crane may be secured by those interested direct from the manufacturer by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

CUMMER ASPHALT PLANTS

Portable Combination Hot and Cold Mix Plants

Portable Hot Mix Plants

Stationary Combination Hot and Cold Mix Plants

Cummer Combination Dryer-Coolers.

Steam Jacketed Mixers 400 to 8000 pounds capacity.

Cummer Internal Fire Dryers

Electric Batch Timers

THE F.D. CUMMER & SON CO.

Euclid and 17th, Cleveland, Ohio

Replaceable Feet For Tamping Rollers

A two-piece cast-steel foot for sheepfoot rollers, providing an easy and speedy method of renewing worn feet right on the job, has been announced recently by the Los Angeles Steel Casting Co., Los Angeles, Calif. The bases of these feet are made of special nickel steel with excellent welding qualities and great strength, and the tips are of chrome molybdenum steel to resist abrasion.

A long tapered shank on the base provides ample surface contact with the socket of the tip, and a flat register in the socket engages with a flat area on the shank to prevent the tip from turning. After the bases are welded onto the tamper drum, subsequent cutting and welding are entirely eliminated. When replacements are needed, the worn tips are driven off and the new ones driven on.

Further information on these replaceable feet, which can be used on any type

of sheepfoot roller, may be secured direct from the manufacturer by mentioning this item.

Joint Filling Pots

Delivery of the stream of material close to the pavement but in full sight of the operator, enabling better, neater work, is one of the features claimed for Tarco sight stream crack and joint filling pots made by the Tarrant Mfg. Co., Saratoga Springs, N. Y. The material is said not to blow or spatter and is under instant finger tip control, fast or slow, just as the operator wants it.

These pouring pots are made in two styles, the No. 46LA for low kettle draw-offs and the No. 46A, the high conical type. Their capacity is approximately 2 gallons, the nozzle sizes are $\frac{1}{8}$, $\frac{1}{4}$ and $\frac{3}{8}$ inch, and they weigh about 6 $\frac{1}{2}$ pounds. The pots are fabricated of pressed steel with welded seams.

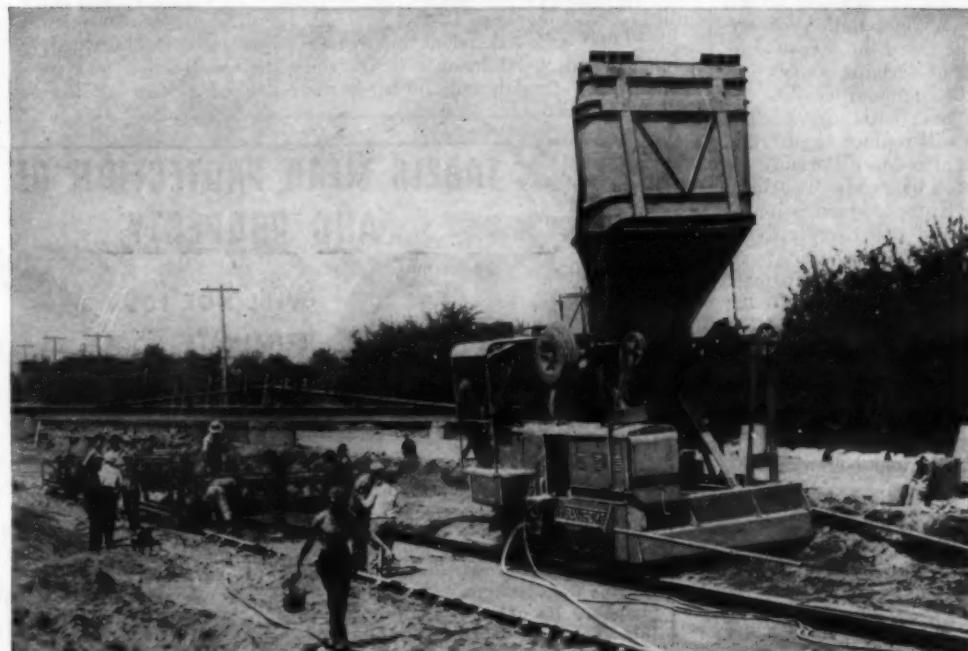
A new bulletin describing and illustrating Tarco joint and crack filling pots may be secured by interested con-



The Tarco pouring pot for crack and joint filling.

tractors, state and county highway engineers direct from the manufacturer by mentioning this item.

The Latest Contribution to Paving Economy



The Ransome 34E "Single Drum" Paver

RANSOME offers the 34-E "Single Drum" Paver for average sized jobs where the capacity of the Ransome 34-E "Dual Drum" Paver is not required.

This latest achievement of Ransome engineers has inherited all of the advantages of the universally-known Ransome Pavers and in addition makes economy on average paving jobs a reality.

Note these features:

- Interchangeability of many parts with the 34-E "Dual Drum" Paver.
- Large engine operating at a slow speed for long trouble-free engine life.
- Full Hydraulic "Finger-Tip" controls for easier and smoother operation of boom swing, water valves, discharge chute.
- While a spreading reach of 32 $\frac{1}{2}$ feet is retained, less counterweight is used than on standard 27-E due to better balance and longer crawlers.

Write for complete information

RANSOME CONCRETE MACHINERY COMPANY
DUNELLEN, NEW JERSEY



Needed Construction For Defense Traffic

(Continued from page 31)

"2. Funds authorized to be spent under the normal plan of operation of the WPA, with the provision that not to exceed \$25,000,000 of the total may be expended for supervision, equipment and materials in excess of the amounts normally expended for such non-labor purposes, on roads certified by the appropriate defense agency as strategically important.

"3. Funds appropriated to the War and Navy Departments and allotted for expenditure on contracts let by the construction quartermaster or public works officers of the various posts. These funds are generally available at present only for certain roads to be improved or constructed within the reservation.

"4. Such amounts of state and local money as can be contributed, in addition to that required in matching the Federal-Aid funds.

"Some access-road construction has already begun as a result of the prompt action of highway departments in several states. One example of this is in Michigan at Fort Custer, where about 2.5 miles of a proposed 14-mile access road are being built at a cost of about \$250,000. The section under construction is considered the most vital link, but the entire mileage is urgently needed to serve a military population of several thousand men, and the surrounding civil population of perhaps 50,000 people, including the communities of Galesburg, Augusta and Battle Creek. The completed road will replace an old road which will be abandoned because of poor alignment and grade, restricted right-of-way, and proposed extension of the reservation, and will carry an estimated 11,000 vehicles a day.

"In recent weeks the War Department has made a number of requests for the immediate construction of surfaced roads for temporary use in building military establishments. The long-established relationship between the PRA and the state highway departments permits placing an engineer on the ground immediately and beginning the work.

"There has been much discussion of the 75,000-mile strategic highway system in recent months. The routes of this strategic system are the more important routes of the Federal-Aid system and are important to our Army for the same reasons that they are important for normal civil uses. They are a network connecting the centers of population and industry and sources of agricultural, mineral and forest products. In fashionsing raw materials into implements of war and in feeding, clothing and training an army, highways will be used in the same manner as in ordinary commerce but much more intensively.

"At about the same time the strategic system was selected, the War Department announced that military equipment would impose no demands on highway



Charles M. Upham's suggested system of defense super-highways.

surfaces and bridges above those of ordinary commercial traffic. Field guns, tanks and all other units have been designed to conform with state highway construction practices. The standard H-15 bridges, for example, are strong enough for all classes of military equipment including tanks up to 50 tons provided they are spaced at least 50 feet apart and slowed down to 4 miles an hour.

"The strategic system does have certain weaknesses, however. These were revealed in the highway planning survey conducted in cooperation with the state highway departments, and include 4,000 miles of road less than 18 feet in width and 14,000 miles deficient in surface strength, and 2,400 bridges below the standard for strength and 500 below the

18-foot standard for width or the 14-foot standard for clearance, or both. These sub-standard sections need to be modernized to put the strategic system in up-to-date condition for either military or ordinary commercial use.

"Correction of these sub-standard conditions was a part of the highway program before the beginning of the defense program. It is now of even greater importance and justifies our insistence that such work must have a place in the Federal-Aid program second only to building access roads to camps and defense industries.

"In a report dated April 27, 1939, the Public Roads Administration (then the Bureau of Public Roads) recommended the construction of a special tentatively defined system of direct inter-regional

highways approximately 30,000 miles in extent, with all necessary connections through and around cities designed to meet the requirements of national defense in time of war and the needs of a growing peace-time traffic of longer range. This and other recommendations made were concurred in by the Secretary of War.

"Such a system would be of value in accommodating the increased traffic resulting from defense activity. The express highways recommended through large cities where traffic is now congested would do much to speed up transportation. But such a program can not be carried through in a short space of time without serious conflicts with the most essential defense activity. These things must necessarily take their place in the long-term highway program."

Charles M. Upham believes that our defense highway requirements include the construction of a system of super-highways to link up centers of population and industry, to connect metropoli-

(Continued on next page)

Minute "HOW" Stories



LeTourneau Equipment Whips Tough Swampy South Carolina Road Job

Stumps, swamps, mud and other general boggy conditions all combined to make Hardaway Contracting Company's 300,000-yard highway contract a tough 17-mile stretch, near Mt. Pleasant, South Carolina. A difficult assignment for any equipment! Yet, Hardaway is handling all work—widening present sections and clearing and leveling new



sections to shorten and straighten the road—with three LeTourneau Carryalls (two 13-yards and an 8-yard) and a LeTourneau Bulldozer.

Ahead of Schedule

Reports C. R. Raley, construction superintendent . . . "We are really putting our paws (Carryalls) through on this job, but they take it and hold up. We are ahead of our deadline, and with this good equipment we intend to stay ahead."

Like the Hardaway Contracting Company, and scores of other successful contractors throughout the United States, you'll find LeTourneau equipment gets work done fast and at low costs. That's especially important with today's defense rush jobs demanding fast production and dependable equipment performance to meet doubled shifts, night-and-day grinds. Prepare yourself NOW to profitably meet those demands . . . by calling your LeTourneau—"Caterpillar" dealer TODAY for a demonstration right on your present job.

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WIRE ROPE CLAMPS mean you will protect your employees' lives and save money by eliminating costly delays due to the biting action of old style clamps, causing the wire rope to break far below its actual strength. Insure against loss of equipment by STANDARDIZING on SAFE-LINE today. Made to fit all right lay ropes.

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6030 Breakwater Ave., Cleveland, Ohio
Branches: New York Philadelphia Chicago Berkeley, Cal.

Federal Funds Must Finance Needed Work

(Continued from preceding page)

tan and other concentration areas with our vast agricultural interior. After his visit to Germany and a study of German super-highways, Mr. Upham charted a modern system of master roads for this nation which could quickly produce a military system second to none and would also eventually solve our major traffic problems.

Another exponent of super-highways is Walter A. Jones, Chairman of the Pennsylvania Turnpike Commission, who proposes an 1,800-mile super-highway system consisting of a seaboard highway connecting Boston, Philadelphia, and Richmond; an extension of the present Pennsylvania Turnpike to connect with the seaboard highway at Philadelphia; and two super-highways from Pittsburgh west, one taking the northern route to Chicago, passing south of Cleveland and Toledo, and the other, passing just south of Columbus and Dayton and north of Cincinnati, would terminate at St. Louis. A connecting spur should be constructed from Chicago to the St. Louis highway, joining it just south of Indianapolis. According to Mr. Jones, this entire system of highways could be constructed at a cost of \$860,000,000.

The state highway planning surveys have indicated much needed improvement on main routes in every section of the country.

In discussing highways for national defense in a recent issue of *California Highways and Public Works*, C. H. Purcell, State Highway Engineer, stated that the surveys made in California revealed that improvements required for the strategic road system would cost about \$150,000,000, not including some \$11,000,000 for access roads planned in that state. The appalling lack of funds necessary to carry on this work is indicated by the fact that California will have a total of only \$19,300,000 for the two fiscal years ending June 30, 1942 and 1943, with which to carry on a \$150,000,000 program for strategic roads in that state alone.

Speaking before the House of Representatives on the 1940 Federal Aid Highway Bill, Hon. Jennings Randolph stated that there are some 6,390 miles of highways in the New England states which should be rebuilt, widened or relocated, and some 506 bridges which should be widened or rebuilt. The total estimated cost of this work is \$388,223,000, but this improvement is merely for immediate peace-time needs to better traffic conditions and promote highway safety. To build highways to serve the dual purpose of civil and military use would probably cost about \$600,000,000. And that sum is the total amount of money available on January 1, 1941, for highway construction in the entire United States, according to Charles M. Upham.

A more complete survey of defense highway requirements by states, based on individual reports from the state highway departments, will be published by CONTRACTORS AND ENGINEERS MONTHLY following the release of the Public Roads Administration report to the President on the adequacy of our highways for national defense.

Financing

So far no special defense funds have been made available for a highway program. The present plans apparently contemplate the use of regular highway funds authorized under the Federal Highway Act of 1940. Beginning the first of this year, in the neighborhood of \$300,000,000 in Federal funds will be available for highway construction. \$236,000,000 of which must be matched by state funds. This amount includes

carry-overs from previous authorizations and allocations under the 1940 highway act for the fiscal year 1942. In addition, the WPA will put an undetermined amount into the program under its normal plan of operation.

A report from the ARBA, however, indicates that the next Congress will give this problem immediate consideration and that appropriate legislation will be introduced shortly after it convenes. It is fairly clear that state and local governments can not possibly finance all the highway construction necessary, and that an appropriation of national funds for this purpose must be made if our highways are to be adequate for defense.

However, at this point we can not stress too forcefully the fact that less of a national appropriation would be needed if the gas tax and motor vehicle money collected from highway users were used for highway purposes. Nearly \$1,000,000,000 of this revenue has been diverted to other purposes during the past 10 years, according to the American Automobile Association. It is now too

late to do anything about recouping that sum, but it is not too late to see to it that during the next 10 years, all of the money collected for use on the highways is used for that purpose.

A scheme for financing defense super-highways, such as his proposed 1,800-mile network connecting the eastern seaboard with the middle west, has been suggested by Walter A. Jones, Chairman of the Pennsylvania Turnpike Commis-

sion. His proposition is a national defense super-highway authority, organized on practically the same basis as the Pennsylvania Turnpike Commission, this authority to have the power to issue bonds which would not be an obligation of the U. S. Government because both principal and interest would be paid out of revenue received from fees collected for the use of these super-highways. This

(Continued on page 52)

WARCO J & S TRACTION TREADS

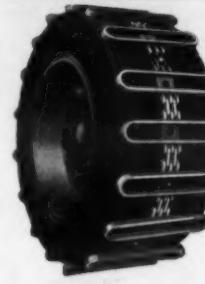
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4-WHEEL HYDRAULICALLY OPERATED, earth moving SCRAPERS. Outstanding for fast operation. Capacities 8, 10, 12, 15 and 20 cubic yards. Send for BULLETINS R163, R164, R165, R167 and R195.



4-WHEEL CABLE-OPERATED, earth moving SCRAPERS dia. load, dump and spread. Capacities 15, 20 and 25 cubic yards. Send for BULLETINS R186, R187 and R194. (Above) Gar Wood double-drum, cable-power CONTROL UNIT, designed and tested for 30 cubic yard loads (Send for BULLETIN R198.)

Gar Wood-Continental 2-WHEEL HYDRAULICALLY-OPERATED, earth moving SCRAPERS. Light in weight. Outstanding for fast operation. Capacities 3, 5, 6 and 8 cubic yards. Send for BULLETINS R179, R183, R201 and R202.



SHEEP-FOOT TAMPING ROLLERS pack 80s. Available in single, double or triple units or tandem combinations. Send for BULLETIN R154.

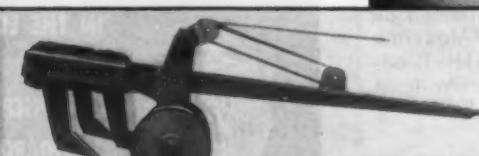


CABLE- AND HYDRAULICALLY-OPERATED RIP-PERS for ripping compacted earth, shale, rock, roots, old pavements and old roads. Send for BULLETIN R184 (Model H-80 Hydraulic Ripper) and BULLETIN R185 (Model C-80 Cable Ripper).

GAR WOOD ROADBUILDERS provide power up and down on blade which raises and lowers. Blade can be set for right- and left-side cutting. Send for BULLETINS R103 and R105.



GAR WOOD BULLDOZERS provide power up and power down on blade with quick control to regulate cut. Send for BULLETINS R204 and R205.



GAR WOOD INDUSTRIES, INC., DETROIT, MICHIGAN, U. S. A.

ROAD MACHINERY DIVISION

ROADBUILDERS

BULLDOZERS

SCRAPERS

TAMPING ROLLERS

RIPPERS



The Elk River Bridge, one of the structures on the relocation of Route 40.

Maryland Rebuilds Important Highway

(Continued from page 24)

inches transversely was required on some sections, and $\frac{3}{4}$ -inch expansion joints on 120-foot centers with contraction joints on 40-foot centers were used throughout to control cracking. The concrete was designed to have a cement content of 1.5 barrels per cubic yard and the cement-water ratio not to exceed 6 gallons of water per sack.

After the center line had been established, a soils survey was made to determine the character of the soil in the various cuts. Borings were made with a hand auger on 200-foot centers along the center line of the proposed roadway to a depth of 3 feet below subgrade. In those instances where visual surface inspection indicated a soil change at closer intervals, borings were made. From these borings a soil profile was plotted. These soil determinations were qualitative rather than quantitative and the information was used to determine subgrade treatment throughout the project and what excavated material would not be acceptable for the formation of embankments.

Unfortunately the geological formation of Cecil County is extremely variable and the pitch of the various strata, coupled with their great variance in short distances, yielded a subgrade which was most non-uniform in bearing value.

It was not unusual to find all the soil types from A-2 to A-7 inclusive within the limits of a 600 or 700-foot length of cut. In those instances where A-5 soil was encountered it was noted on the plans that this material was to be wasted. In those sections where the A-6 and A-7 soils were encountered at subgrade it was removed to a depth of 1 foot below subgrade and replaced with sub-base which met the following gradations:

| PER CENT PASSING | | SQUARE OPENING | Screens |
|------------------|--------------|----------------|---------|
| Minimum | Maximum | | |
| 2½-inch | 100 per cent | | |
| 2-inch | 30 " | 100 per cent | |
| 1-inch | 70 " | 100 " | |
| No. 10 | 25 " | 70 " | |
| No. 100 | 0 " | 20 " | |

The plasticity index of the material passing a No. 40 screen could not be more than 3. This sub-base was obtained locally.

Underdrains

Interceptor underdrains were installed at the toe of the slope through the cut sections at an average depth of 3 feet below subgrade to prevent ground water reaching the subgrade. In those sections where sub-base was used, underdrain was placed parallel and adjacent to the out-

side of the sub-base. Perforated 6 and 8-inch asphalt-coated corrugated-metal pipe was used, with a stone covering of the following gradations:

| | |
|----------------|--------------|
| Passing 1-inch | 100 per cent |
| " ½-inch | 90 " |
| " No. 4 | 0 to 5 " |

At any location in the park area or under the road bed proper where subsurface water was encountered during the excavation operations, the same type of underdrain was used. Asphalt-coated corrugated-metal pipe of the same diameter as the underdrain was used for outlets, where necessary.

Surface drainage is carried in V ditches at the toes of slopes through the cut sections and along the center line of the park area. This area is drained to inlets at the sump points or at the upper side of the cross-overs. The V ditches are outletted at the end of the cut through concrete flumes laid down the fill slopes. Where the longitudinal grade of the roadway exceeded 3 per cent, concrete gutters were constructed in the V ditch. In designing the section, due consideration was given to snow removal and there is adequate room to get the snow entirely off the road surface. Berm ditches were constructed at the top of cut slopes, where necessary, to intercept surface water and prevent erosion of the face of the slope.

In the grading of the project, every effort was made to preserve the natural beauty. In those instances where it was possible to preserve the existing trees or shrubbery in the park area, this was done. In the construction contracts it was a requirement to salvage such top soil as was excavated to be used for the top soiling of the park area and the fill slopes. It is proposed immediately upon the completion of the paving to landscape the entire roadway and to develop the full possibilities of the terrain.

Costs

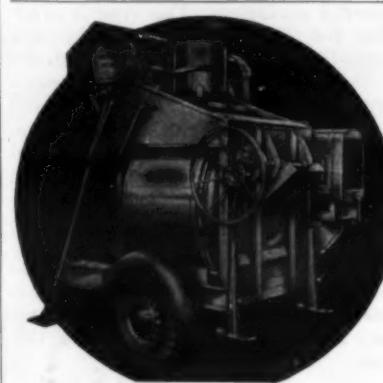
The estimated cost of the entire proj-

ect was \$7,500,000.00. The bridge construction was financed by a PWA grant of 45 per cent of the construction costs and the sale of 30-year revenue bonds, exclusive of interest during construction and bond discount. The estimated cost was \$4,630,000.00 and the actual cost \$4,125,406.00 for the bridge and its approaches. The estimated cost of the roadway was \$2,870,000.00 and the actual cost, \$2,612,565.00.

Further details on this project and descriptions of the construction of various sections of the work will appear in subsequent articles on this Maryland project, which now has an increased importance because of its strategic location as the main artery in the eastern coastal industrial area and therefore is a vital link in the defense highway system.

Personnel

The Maryland State Roads Commission is headed by Major Ezra B. Whitman, Chairman, and Commissioners P. W. Webb and W. Frank Thomas. Wilson T. Ballard is Chief Engineer.



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- AUTOMOTIVE-TYPE TRANSMISSION, 30% to 40% more efficient, quieter, longer lived.
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FEMALE HOSE COUPLING

STYLE X-34

A washer-less, leak-proof coupling that's guaranteed to provide important savings in service and maintenance costs. Copper insert in spud fits rounded head of stem, forming soft-to-hard metal seal that will not leak, regardless of wear or the presence of abrasive particles. No service interruptions to replace washers, and no possibility of blow-offs. Sizes $\frac{1}{2}$ " to 4" inclusive, with 4-bolt "BOSS" Interlocking Offset Clamp on 1" and larger; 2-bolt clamp on $\frac{1}{2}$ " and smaller.

"BOSS" WASHER TYPE FEMALE HOSE COUPLING

STYLE W-16

Same as above, except that head of stem and coupling end of spud are flat, to accommodate washer. Sizes $\frac{1}{2}$ " to 4" inclusive. Cadmium plated—rust-proof. All "BOSS" and "GJ-BOSS" Couplings are designed to actually protect the ends of the hose upon which they are used, permitting the hose to be kept in service longer without cutting back to reset couplings.

NEW "COR-O-ZIG" STEMS: This patented design affords a tighter grip of hose on coupling under clamp pressure. Regular corrugations for half the length of the stem; zigzag corrugations for other half. Now furnished in malleable iron on all "GJ-BOSS" and "BOSS" Couplings (male and female) in sizes $1\frac{1}{4}$ " and larger. (Corrugated steel stems furnished in sizes 1" and smaller).



"BOSS" MALE COUPLING

STYLE MX-16

The companion coupling for the "GJ-BOSS" and "BOSS" couplings described above. Much more practical and economical than standard iron pipe nipple, it eliminates the need of ever-size hose. Cadmium plated—rust-proof. Sizes $\frac{1}{2}$ " to 4" inclusive, with same clamps as "GJ-BOSS" and "BOSS" Female Couplings.

NEW CORRUGATED STEEL STEMS

To further increase their strength and durability, "BOSS" Male Couplings, sizes $\frac{1}{2}$ ", $\frac{3}{4}$ " and 1", now have stems of corrugated steel. (Sizes $1\frac{1}{4}$ " and over, have malleable iron "COR-O-ZIG" Stems, described above.)

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Main Office and Factory: Philadelphia, Pa.
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Dragline buckets for all types of work • Capacities $\frac{1}{2}$ to 15 cubic yards

There's a reason why more Page Dragline Buckets are used than any other make. By their yardage records on all types of work, Page Buckets have established a reputation of being able to outdig

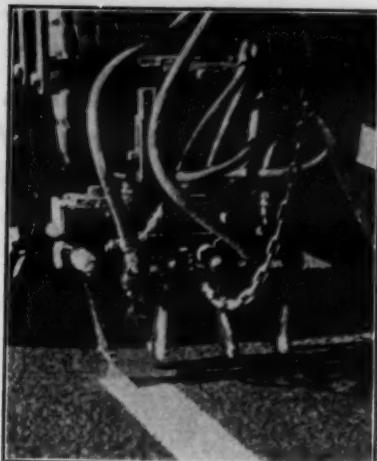
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PAGE ENGINEERING COMPANY

Page Automatic Dragline Buckets • Page Walking Dragline Machines
CLEARING POST OFFICE, CHICAGO, ILLINOIS



The spray head and air curtain of a Kelly-Creswell striping machine.

Air Curtain Feature Of Traffic Striper

The feature of the Kelly-Creswell machines for center-line and traffic-stripe marking is the Air Curtain Guide Plates by means of which compressed air or exhaust gas, distributed from a manifold through especially designed millings in the air curtains, maintains a clean-cut straight edge over any type of surface, rough or smooth, at any speed, according to the manufacturer.

These machines are made in several models, including the WV series of complete truck units for one or two-color line applications, portable self-contained units, truck-trailer types and tractor attachments, and a pusher type.

The Model WV-2 is mounted on a standard 1½-ton truck with dual rear wheels, and includes special DeVilbiss QM pressure-type material containers; two Kelly-Creswell air-controlled spray heads with a capacity up to 2 gallons a minute and width adjustment from 2 to 6 inches; the Air Curtain Guide Plates attached to a hanger and held in position by springs; an adjustable and hinged guide arm attached to the front bumper; a flexible speaking tube for communication between driver and operator; a cleaner mechanism for forcing cleaning fluid through the spray heads and air curtains; and the usual standard accessories of tool boxes, flag holders and signs. A surface cleaner designed to remove loose particles and dirt from the path of the spray heads by means of a wire brush and air stream is available

at extra cost. Model WV-3 is similar to WV-2 in all respects except that it is equipped for two-color triple-line application.

The Series B portable equipment is completely self-contained, mounted on a tubular frame with spray head and air curtain assembly just inside the rear wheels, and is designed for use on short sections where the use of a truck unit is impractical. B-3 is self-propelled, has a 7-gallon paint container, a twin-cylinder Type 220-DeVilbiss compressor, manually-controlled K-C spray head mounted in a special holder, Air Curtain Guide Plates, and adjustable and removable 60-inch guide arm equally suitable for chalk line or retracing, and a specially designed mechanical cleaner as standard equipment. Models B-2 and B-4 are similar, except that B-2 is hand-propelled and B-4 is equipped for both single and double-line application.

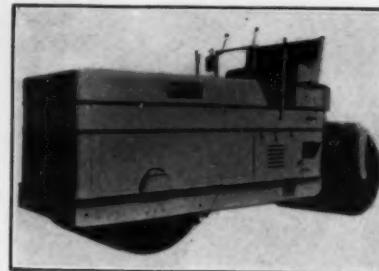
Series M consists of the spray head and air curtain assembly mounted on a two-wheel trailer and is attached by a trailer hitch to a truck on which is mounted the compressor equipment, and material containers. This type is available for single, double or two-color triple-line application. In the Series K, the spray head and air curtain assembly, compressor and control panel are mounted on a tractor, the material container also on the tractor or on a special trailer attached to the tractor, and the compressor takes its power from the tractor through a power take-off.

Literature describing and illustrating all these Kelly-Creswell traffic line marker models may be secured by those interested direct from the Kelly-Creswell Co., Xenia, Ohio, by mentioning this item.

New Tandem Roller Of Variable Weight

A streamlined variable-weight tandem road roller, incorporating many new operating features, has just been announced by the Huber Mfg. Co., Marion, Ohio. Simplicity of operation, plenty of speed, maximum maneuverability, centralized control of every roller movement, low maintenance, and all-round operating economy are features claimed for this new unit.

Among its operating features are variable weight, three speeds forward and reverse, dual controls for operating the machine from either side; automotive



The new Huber tandem roller.

type construction; ease of operation; high frame clearance; easy hydraulic steering; anti-friction bearings at all strategic points; all moving parts fully accessible; full-width seat; a large-capacity sturdily built water tank; and rust-resisting sprinkling pipes. Power is furnished by a Buda gasoline engine, either air or radiator cooled. It is available mounted on skids, motor truck, or trailer. A small size, driven by an electric motor, can be obtained on special order.

Further information on this new addition to the Huber line of road machinery, which includes six sizes of automotive-type rollers and the Huber Model

BG grader, may be secured by interested contractors and highway engineers direct from the manufacturer.

Drills, Boring Tools And Earth Samplers

The Acker Drill Co., Scranton, Penna., presents in its Bulletin 21, descriptive data on the Model LD core drill and its applications, four operations in soil sampling and rock core drilling, and a list of accessories to make up a complete test-boring earth-sampling and core-drilling rig. According to the manufacturer, the Model LD is simple to operate, having no feed gears, feed screw, or racks and pinions. For drilling test cores from highways and concrete structures it is connected directly to a clutch-equipped gasoline engine, either air or radiator cooled. It is available mounted on skids, motor truck, or trailer. A small size, driven by an electric motor, can be obtained for laboratory use.

Copies of this bulletin will be sent to those writing direct to the manufacturer.

2,000,000

Horsepower-hours for \$100 upkeep

TELEPHONE PALISADE 6-6400

THOMAS HENRY MATERIAL CO.
ESTABLISHED 1888

MASONS' MATERIALS
READY MIXED CONCRETE — BATCHED AGGREGATES **RECEIVED**

ONE - Yard - Deck
FOOT OF 16th STREET
WEST NEW YORK, N. J.

November 9th, 1939

W. H. Merleco.

Waukesha Motor Company
33 West 60th Street
New York City, New York

Dear Mr. Kiefer:

I know you will be interested to know of the great success we are having with the Waukesha Hesselman engine model 6-ELH #392607 in our Model S7 Thew Crane, and we give you our experience with it as follows.

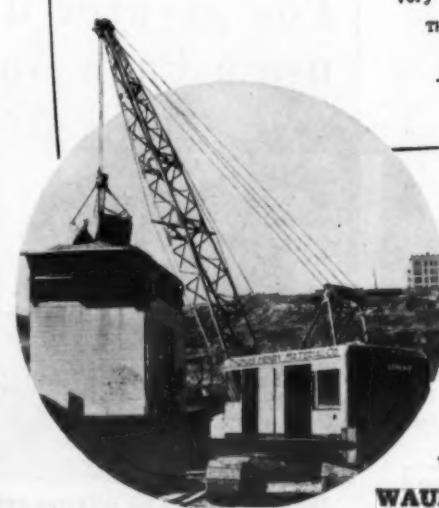
This crane was purchased new in January, 1937 and had 13,000 hours of operation to its credit on September 4th, 1939. We did a valve and carbon job on it at that time and found only a very slight wear in the sleeves in the ring travel and the original pistons are still in use although a new set of rings were installed at this time. Our total service cost during this entire period was \$100.00.

We attribute this partially to the manner in which we take care of our equipment and use only the best we can obtain in fuel and lubricating oils. Should occasion require we will again specify this power in our equipment.

Very truly yours,

THOMAS HENRY MATERIAL COMPANY

Paul A. Federico.
Paul A. Federico



LOOK AT THE RECORD
of the 6-ELH Waukesha-Hesselman Oil Engine in this Lorain-87 clamshell purchased new in Jan. 1937 by the Thomas Henry Material Co., Union City, N.J. Equipped with 60-ft. boom it is on the job every day unloading barges of building material and charging into loading bins on the docks...

READ THE LETTER

WRITE FOR BULLETIN 1175

WAUKESHA MOTOR COMPANY
WAUKESHA • WISCONSIN
NEW YORK • TULSA • LOS ANGELES

FOR THE GREATEST OVERALL ECONOMY

WAUKESHA OIL ENGINES

**NOT ONE CENT FOR REPAIRS
in 17 YEARS!**

Every working day, for 17 years, a Williams ¾ Yard Bucket has been unloading crushed rock and sand from railroad cars for the Concho Sand and Gravel Co., Oklahoma City. In all that time of heavy duty service, not one penny has been paid for repairs or maintenance. Now a set of pins and bushings is being shipped to start the bucket, as good as new, on another seventeen years of service.

Williams Buckets and Parts are stocked by distributors in all sections of the country.

Send for free bulletins covering Williams Buckets for all types of service.

Now
WELDED
Rolled Steel
CONSTRUCTION

THE WELLMAN ENGINEERING CO., 7012 Central Ave., Cleveland, Ohio

WILLIAMS Buckets
built by WELLMAN

Open Illinois Roads Necessary to Defense

(Continued from page 9)

Equally important in the manufacturing process is the need for the transportation of the workmen employed at these plants from and to their homes.

Today, many employees live long distances from the plants in which they work and the manufacturing process itself depends on the regularity of attendance of these employees. Interruption of highway traffic may materially affect production by reducing the attendance of working forces.

Illinois in Key Position

The key position of the state of Illinois in regard to transportation over state highways is worth examination. From within the borders of Illinois, the Atlantic seacoast from Massachusetts to northern Florida, and the coast of the Gulf of Mexico from western Florida to far down into Texas can be reached in two days' travel by automobile, bus, and truck. Because of the fact that the northern end of Illinois is tied to the southern end of Lake Michigan, and that the state extends south down the Mississippi River basin two-fifths of the distance from the Lake to the Gulf of Mexico, an unusual situation exists in the scheme of transcontinental traffic. A large number of the transcontinental routes cross the state from east to west, such as U. S. 20, extending from Chicago northward and westward through Elgin and Rockford to Dubuque in northern Iowa; U. S. 30, a transcontinental road of major importance extending from Philadelphia, Pittsburgh, and Fort Wayne, across Illinois through the cities of Joliet, Aurora, and Sterling to Clinton, Iowa, and extending on westward through Cedar Rapids and Omaha toward Salt Lake; U. S. 36 connecting with important highways from the east at Indianapolis, Indiana, and extending almost due west through Illinois by way of Decatur, Springfield, and Quincy,



Typical conditions following a 1940 snow storm in Illinois, showing the depth of drifts, and the safety sign on the rear of the plowing unit.

and into the states farther west; U. S. 40 beginning at Baltimore, Maryland, and running westward through Pennsylvania, Ohio, and Indianapolis in Indiana, thence southwest across Illinois to St. Louis and extending on westward through Missouri toward Kansas City and Denver. There are also other important east and west transcontinental

routes across the state.

Products moving by highway toward the southeast from Wisconsin, Minnesota, and the northwestern states must cross Illinois on the diagonal roads. The same situation is true in regard to trucks, automobiles, and their allied products manufactured in the industrial areas of southern Michigan and

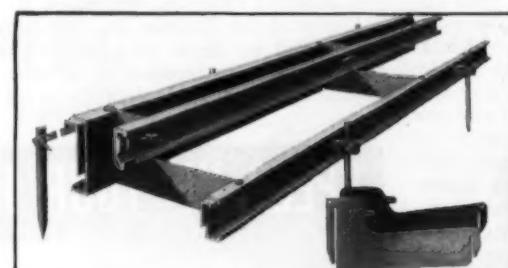
northern Indiana and distributed by highway toward the southwest. Two of the most important cities in the United States, Chicago and St. Louis, with their immense industrial areas, are connected by a diagonal highway which lies wholly within the state of Illinois.

All of this truck and automobile traffic across the state, when added to the traffic originating within the state, imposes an obligation of major importance on the officials and employees of the Illinois State Highway Department. Today, due to improvements in the design of automotive equipment, drivers and passengers in trucks, cars, and buses are almost as comfortable in these vehicles as they would be in their own homes, offices or workshops. The hazards which they encounter are to be found in the condition of the highways over which the vehicles operate.

Illinois Weather Problems

Weather conditions unfavorable for any highway traffic are fog, rain, ice and

(Concluded on page 50)



Steel Curb and Gutter Forms for any cross section or specification. Catalog S-20.

Heltzel
BUILDS IT BETTER

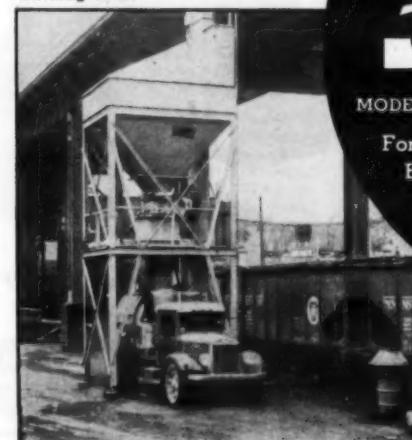
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Equipment for all Concrete Projects

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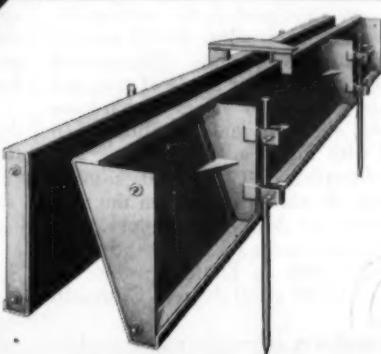
The New Heltzel Military Highway Form. Catalog S-19.



Portable Bulk Cement Plants with built-in elevators. Catalog T-28.



Concrete Buckets from $\frac{1}{2}$ to 3 cu. yd. capacity. Catalog T-29.



Steel Forms for Straight or Battered Curbs with Rigid Radius or Flexible Forms to match. Catalog S-20.



Portable Batching Bins from 35 to 200-ton capacity. Catalog S-18.



Below — A Typical Heltzel Truck Mixer Charger — 300-ton Batching Bin — 1200 Bbl. Bulk Cement Reserve.



What Blade is now doing a grand double job of breaking up ice and packed snow on roads in winter, and scarifying, smoothing and leveling highways all the year 'round?

The answer:

The SHUNK Saw-Tooth Blade

(Attach it to any Grader, Maintainer or Snow Plow.)

Write for circular

See also, on page 45 of this issue, illustration of the SHUNK D-K Spreader and Finishing Machine.

THE SHUNK MFG. CO.
BUCKEY OHIO

BINS, Portable and Stationary
CEMENT BINS, Portable and Stationary
CENTRAL MIXING PLANTS
BATCHERS (for batch trucks or truck mixers with automatic dial or beam scale)
BITUMINOUS PAVING FORMS
ROAD FORMS (with lip curb and integral curb attachments)
CURB FORMS
CURB AND GUTTER FORMS
SIDEWALK FORMS
SEWER AND TUNNEL FORMS
CONCRETE BUCKETS
SUBGRADE TESTERS
SUBGRADE PLANERS
TOOL BOXES
FINISHING TOOLS FOR CONCRETE ROADS

HELTZEL STEEL FORM & IRON CO.
WARREN, OHIO • U. S. A.

Road-Mix Surfacing With Crushed Stone

Using Uniform-Size Stone With Tar Binder, Town of Franklin, Mass., Improves Heavily Traveled Roads

(Photos on pages 1 and 56)

RE-CONTOURING and resurfacing an old surface-treated gravel road which was somewhat cracked and had many depressions was the job tackled by the Street Department of the Town of Franklin, Mass., during the summer of 1940. The economy of the work was due in large measure to the fact that the two operations were done simultaneously with a road-mix covering the 24-foot road with a minimum of 1 inch of the tar-bound aggregate well bonded to the old surface. This method is designed to give a uniform non-skid surface free from blemishes, such as fat spots and lean areas, in the road-mix when spread over the road surface. The fat spots spoil the appearance of the surface and would tend to crawl, and the lean areas to disintegrate under traffic.

For convenience in operation, the work was done in 740-foot sections. One hundred tons of $\frac{5}{8}$ -inch stone provided the required aggregate and a 1,200-gallon tank of Tarvia A, meeting state specifications for T-9 tar with a float test of 120-200 seconds at 32 degrees F., was sufficient for the tack and binder applications. The work was slowed up slightly because the six trucks, owned by the town, did all the hauling which required 52-mile round trip per load.

It is recommended that 100 pounds of stone per square yard be used as a minimum. To this amount must be added the estimated amount of stone necessary for depressions or uneven surface, and the 10 to 15 pounds per square yard for the chinking seal. The pounds per square yard used in the various sections varied from a low of 105 pounds to a high of 160 pounds. The crushed stone should be a fair grade of trap and the gravel stone of sufficient hardness to resist abrasion under rolling when coated with bitumen.

Specification T-9, 120-220 seconds float test, should be used when the temperature is 65 degrees and above. For temperatures under 65 degrees, Specification T-6 with an Engler specific viscosity of 26-40 at 50 degrees C. should be used.

The uniform aggregate was spread in a windrow 4.25 inches deep and 7 feet 8 inches wide by dumping the load into a Burch spreader box gradually, with the truck driver watching the signals of a man riding the running board. Two men attached the box with chains to the truck and then checked the flow from the dump body into the box if the flow was too fast.

The windrow was shot with Tarvia A, which has no solvent, at the rate of $\frac{1}{2}$ -gallon per square yard of finished surface or 1.35 gallons per linear foot of 24-foot road. The stone as applied amounted to 100 pounds of stone per square yard of 24-foot roadway. Mixing started immediately with an Adams power grader with a 12-foot blade cutting one-half of the windrow and moving it across the road. Then on the return trip the second half of the windrow was turned over into the place first occupied by the other half. Following the first moving of the windrow across the road, the tar distributor shot the tack coat over the half of the road occupied by the windrow and then, when it was moved back, completed the tack coat on the other side.

About five round trips of the grader were sufficient to mix the tar and aggre-

gate thoroughly so that the stone was fully coated. If this work could not be completed by night the material was windrowed at the side of the road for overnight. After mixing was complete (and with this binder curing is not necessary because of the absence of solvent), the material was spread the full 24 feet and rolled by a 12-ton Buffalo-Springfield gas roller until the surface was set up and showed no movement under the rolls. The seal consisted of chinking the surface voids with from 10 to 15 pounds per square yard of fine crushed trap rock known as rice stone. While rolling was continued hand brooming was used to give a uniform distribution of the fines over the surface. When all of these had been rolled into the surface to fill the surface voids, traffic was permitted to use it.

It is believed that the seal coat can be eliminated for several years by using a road mix with the percentage of bitumen rather high, or about 5 per cent by weight. If a seal coat is used, it should be of the fog type so as not to flush over the stone. Two and a half miles of armor coat of this type constructed during the 1939 season gives every indication at this time that the method described above is a practical way to obtain heavy stone seal coats at moderate cost. In this territory 15 cents per square yard is the usual price for gravel stone and 20 cents for crushed stone.

Other Sections With Gravel

The Town of Franklin has completed two sections of about 1,500 feet total length, using washed screened gravel in sizes from $\frac{1}{8}$ to $\frac{1}{4}$ -inch for the aggregate. The work was done in the same manner as the work described above, except that 5 per cent by weight of T6 specification tar of 26 to 40 Engler viscosity was used. Tarvia meeting this specification was applied, mixed and rolled in the same manner as the crushed stone. Rice gravel was used as the surface filler instead of rice stone.

The work in Franklin, Mass., was done under the direction of Charles H. Robinson, Superintendent of Streets.

Bulletin on Compressors

Among the features claimed by Schramm, Inc., West Chester, Penna., for its line of Utility compressors are light weight; electric starting; cam-operated intake valve increasing valve life and efficiency; large discharge valve



C. & E. M. Photo
Applying Tarvia A to the windrow of $\frac{1}{2}$ -inch stone on a town road in Franklin, Mass.

for lower lift, less wear and trouble-free operation; full-force feed lubrication to every moving part in both compressor and engine, and streamlining.

These features are described in detail in a bulletin, No. 3900, recently issued by this company and devoted to the Schramm De Luxe, gasoline and diesel Utility compressors which are available in a variety of mountings.

Copies of this Bulletin No. 3900 may be secured by those interested direct from Schramm by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

Material Handling Units

The C. O. Bartlett & Snow Co., Cleveland, Ohio, has recently issued a new general catalog, No. 90, replacing the former No. 50 and No. 74 catalogs. The new book contains 372 pages and gives complete details on Bartlett-Snow elevators and conveyors, chains and sprockets, crushers, gates and miscellaneous equipment.

Copies of this catalog may be obtained by those interested direct from the manufacturer by mentioning this item.

SPEED UP YOUR JOB AND CUT COSTS With STEVENS EQUIPMENT



TURN-O-MATIC CEMENT BOXES
Delivers cement to skip faster with less labor. All cement is discharged at right time in perfect condition. Lid remains permanently tight until easily opened by spotter. Best of all, Turn-o-matic Boxes will last for years.

THE STEVENS METAL PRODUCTS CO., Niles, Ohio



CEMENT BATCHERS
Easy way to deliver bulk cement from car to working platform. ONE MAN can push and maneuver the batcher even in close places—also easy to dump with complete discharge. Reduce your labor costs. Capacity 7 sacks.

PREPARE YOUR PLANT... FOR PREPAREDNESS WORK... WITH A SIMPLICITY MIXER.

AIRPORTS, CANTONMENT ROADS & MILITARY HIGHWAYS MUST BE BUILT RAPIDLY—REGARDLESS OF WEATHER



HOT-MIX PLANT-MIX ASPHALT is the ONLY answer...

Equip your plant to meet the demand with a Simplicity Mixer, Dryer, Feeder, Tank OR A COMPLETE SIMPLICITY ASPHALT PLANT

WRITE FOR DETAILS.
NO OBLIGATION.
NO ANNOYANCE.

THE SIMPLICITY SYSTEM COMPANY

CHATTANOOGA, TENNESSEE

D E P E N D A B L E



Digging drainage ditch in hard pan for the drainage of the taxi strip at the Snohomish County airport.

Snohomish County Builds New Airport

(Continued from page 15)

old industrial railroad, now government-owned, most of the material was moved by rail. Five 20-ton locomotives and fifty-one 6-cubic yard railway dump cars were used for this purpose. Considerable saving was attained by firing the locomotives with wood fuel salvaged from the clearing operations.

In order to prepare the field for emergency landings as soon as possible, the north-south runway was surfaced as soon as this portion of the field was cleared and graded.

In preparing the area for the occupancy of the Air Corps, it will be necessary to clear and grub an additional 80 acres of land and to move about 400,000 cubic yards of excavation. This will probably be done by the WPA under the Defense Program.

Paving the Runways

Practically the entire cut section of the field is hardpan. The surfacing of the landing strips consists of from 6 to 12 inches of pit-run gravel ballast which, after being leveled and rolled, is given a prime coat of road oil on which is placed a 2 1/4-inch bituminous mat, of either the plant-mix or road-mix type, followed by a seal coat of RC-4 road oil covered with a very fine pea gravel and rolled.

The north-south runway is now surfaced with SC-1A for the prime coat and MC-2 road-mix type mat, seal-coated as described. The southwest-northeast runway has been ballasted and covered with a prime coat of MC-2 road oil. The surfacing on the north-south runway was furnished and placed by the County, but it is expected that the Federal Government will place the balance of the surfacing under the Defense Program, in which case the mat will probably be placed by machine, using a plant mix and RC-4 road oil.

Flight Facilities

Lighting equipment and other flight facilities have been installed to facilitate further the emergency use of the field, even though the other runways are not yet complete. A 24-inch revolving beacon has been installed on a 50-foot emergency tower and a lighted wind cone is also in use. The completed portion of the north-south runway is lighted by 55 flush-type contact lights and five range lights at each end of the strip.

The CAA has erected a radio station some 3 miles southwest of the field and a radio beam, operating on a frequency of 209 kilocycles, crosses the airport.

Costs

This is a joint project of Snohomish County, C.A.A. and the WPA, the County having spent to date about \$300,000

while the Federal Government has spent \$1,100,000. The original set-up was for a total expenditure of \$1,676,636 of Federal money and a County expenditure of \$470,181. It is contemplated at this time that the Federal Government will complete the grading and surfacing of the runways under the Defense Program, leaving the balance of the county funds to be used toward the construction of the buildings.

The work to date has gone forward at a reasonable unit cost for the different items of construction. Dirt, which has been hauled an average of about 2,000 feet, has cost about 23 cents a yard, and surfacing, including the ballast course, has cost about 75 cents a square yard.

On this project the County furnished the land, that part of the equipment previously mentioned, most of the ballast gravel delivered on the runway, all of the washed gravel for the backfill around the drain pipes, all of the road oil and aggregate used on the hard surfacing, as well as numerous other items,



For the long hauls an industrial railway, loaded by a county-owned 1 1/2-yard Lorain, removed the surplus excavated material at Snohomish County airport.

such as plans, designs, and miscellaneous equipment. Since September 1, the

County has been relieved of most of this cost. It is still furnishing the same equipment, but the gas, oil and operators are being paid for by the WPA.

Flame-Hardening Apparatus

A new 12-page bulletin has been issued by the Air Reduction Co., 60 East 42nd St., New York City, making available to the metal working industry details on the considerations and apparatus involved in flame-hardening surfaces of various forms and describing specifically the Airco Style 4383 water-cooled flame-hardening torch and the variety of extensions and types of tips available for use with it. Information on special equipment such as torch holders and adjusting arm is given, as well as a discussion of the use of the Airco No. 4 Radiograph, a portable machine especially serviceable for mounting the flame-hardening torch.

Copies of this bulletin may be obtained by those interested direct from the manufacturer.

**YOU
TRY IT**



7 FACTS ABOUT LUBRIPLATE

1. Produces ultra-smooth, wear-resisting bearing surface.
2. Reduces friction — lowers maintenance and power costs.
3. Resists rust, corrosion, pitting.
4. Assures clean lubrication.
5. Outlasts ordinary lubricants many times.
6. Economical — a little goes a long way.
7. Available in fluid and grease types for every need.

LUBRIPLATE DIVISION
FISKE BROTHERS REFINING COMPANY
NEWARK, N. J. TOLEDO, OHIO

LUBRIPLATE
THE MODERN LUBRICANT
THAT ARRESTS PROGRESSIVE WEAR



D-K SPREADER AND FINISHING MACHINE

Will Cut Your Costs

- ★ SPEED — 1,000 to 1,200 tons of hot or cold mixed material per day right over the old road surface — no scarifying, no filling of holes or ruts needed.
- ★ ECONOMY — Initial investment is low, it brings big savings in labor and eliminates waste of materials.
- ★ SMOOTH ROADS — This spreader rides on the finished surface so that its work is not affected by worn surfaces of old roads. Depth and width of spread is accurately controlled. Front wheel heights are adjustable. Extra wheels are supplied for use when the machine is to be transported from one job to another.

SHUNK MFG. COMPANY
Bucyrus, Ohio, U. S. A.



Push-loading for Profits with a 16-yard Heil Cable Scoop.

**More Payloads per day
at lower cost . . .**

with HEIL Dig-N-Carry Scoops

That's what E. J. Tuma and Son of Lonsdale, Minn., found in operating on the same job with competitive scoops of equal capacity. And many other contractors also know they can rely on Heil Dig-N-Carry Scoops to do clean-cut, on-time work at real savings in operating costs and service expense . . . Equip yourself for Profits with Heil Dig-N-Carry Scoops . . . Send for free Heil Road Machinery catalog.



You get a big payload every time with Heil Dig-N-Carry Hydraulic Scoops.



Heil Bulldozers and Trailblowers are fast, accurate, dependable dirt-moving tools.

THE HEIL CO.
MILWAUKEE, WISCONSIN HILLSIDE, NEW JERSEY

Cable Scoops — Hydraulic Scoops
Scoops — Bulldozers — Trailblowers — Tamping Rollers — Hydraulic Dump Units

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Company _____

Address _____

City _____ State _____

Old Bridge Replaced By Modern Structure

(Continued from page 29)

ums on a single continuous footing. These columns are each 30 feet high, 6 feet 7 inches wide at the base and 11 feet 3½ inches long at the base. At the top the columns are 3 feet 10 inches wide and 5 feet 10 inches long. They consist of short parallel flat sections with rounder noses of variable radii. They have a ½-inch batter on the flat sides and a 1-inch batter on the extreme ends of the circular noses. The two columns carry a beam 3 feet 10 inches wide doubly reinforced, 3 feet high and 28 feet 6½ inches long. This beam with the two abutments carries a pair of variable section deck-plate girders with I-section floor beams and a 6½-inch concrete deck.

An excellent set of forms was built for these complicated columns, using ½-inch oiled plywood as the form lumber with vertical 1-inch lagging. The ribs were 2 x 10-inch timber shaped and spaced 18 inches center-to-center vertically. Then 6 x 6-inch "strong backs" were used, tied through the forms with ½ x ¼-inch steel tape and locked in a special Universal Form Clamp head with a heavy cut-steel nail after the tape had been drawn tight with a special Universal hand jack.

Concreting the Piers

With the aggregates stockpiled on the construction trestle, as for the footing, and using the same wheelbarrow scales, the contractor mixed the pier concrete in a Smith 10-S mixer, pouring it into a ¾-yard Blaw-Knox roller-gate bucket which was swung by the Northwest crane with a 45-foot boom to a hopper at the top of the pier column. It was dumped into the forms through an elephant-trunk chute and vibrated in place with a Mall mechanical vibrator driven by a small gas engine mounted on the platform at the top of the form.

A 2-inch Marlow pump set up on the construction trestle was used to supply water from the Black River for mixing the concrete, for spraying the forms prior to placing the concrete and for curing.

Personnel

On the bridge portion of FAP

135-H(1), on which work was started May 6, 1940, the completion date was November 15, 1940, which was met readily by W. W. Wyman, Inc., Shelburne Falls, Mass. W. W. Wyman acted as his own Superintendent on this work, with W. R. Casey as Foreman. For the Vermont Highway Department, E. W. Carley was Resident Engineer.

A Hot-Poured Seal For Concrete Joints

It is generally accepted that a proper functioning joint-sealing material for expansion and contraction joints in concrete pavements should be of the hot-poured type, readily poured from a standard handpot into the joints, or into cracks for sealing, and that it should harden quickly enough to permit traffic over it within a short time after pouring. A new rubber compound which fulfills these requirements has been given thorough tryouts under all weather conditions during the past three years on heavily traveled routes. This new hot-poured rubber compound, Rai-Seal, manufactured by Rubber Associates, Inc., 1230 Sixth Avenue, New York City, may be used for new construction or for maintenance, because it is handled in the same manner as an asphaltic or tar filler, with which the average construction foreman or maintenance man is familiar. Rai-Seal is packaged in 50-pound multiple bags from which the paper covering is easily removed, and the material is then ready for melting in the usual torch-heated asphalt kettle.

This composition of rubber adheres to the concrete surface fully, it is resilient at low temperatures while being extended, and its non-flowing properties at continued summer temperatures when under compression from the expanding concrete are assured.

The manufacturer reports that Rai-Seal is particularly adaptable as a top seal for a depth of 1 to 1½ inches over a preformed filler strip of the non-extruding type.

Road Oil Production

Road oils produced by the petroleum refining industry in 1939 increased in both gallonage and value over 1937, according to a preliminary report on the Census of Manufacturers for 1939. In that year production amounted to 861,772,078 gallons, compared with 592,556,892 gallons in 1937. Value at the

refineries increased from \$19,521,797 in 1937 to \$25,680,795 in 1939.

Of the total road oil production in 1939, 608,914,551 gallons were liquid asphaltic road oils, with a value of \$17,142,266. This compares with 481,135,078 gallons in 1937, valued at \$16,417,605. Other road oils made in 1939 totaled 252,857,527 gallons, as compared with 111,421,814 gallons in 1937.

Asphalt, other than liquid, decreased in production and value between 1937 and 1939. Output in 1939 was 2,344,595 tons, valued at \$20,852,435, while in 1937 production was 2,971,038 tons, valued at \$31,352,147. Residuum or tar increased in gallonage from 20,421,403 to 52,029,686, but declined in value from \$853,393 to \$822,242.

These figures cover the operations of 485 plants in 1939 and 365 in 1937.

30

OPERATORS PREFER HYDRAULIC STEERING

IT'S STANDARD ON GALION MOTOR GRADERS

25% MORE WORK WITH LESS
EFFORT—ASK THEM

Investigate This and Other
Features on Galion Motor
Graders

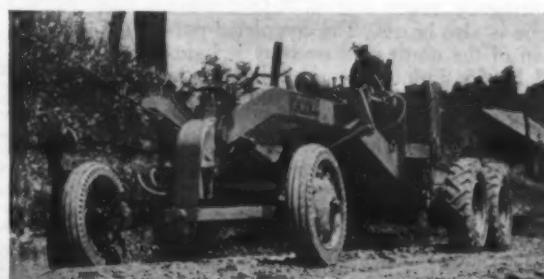
It's Galion in 1941



View of front end of No. 101 motor grader showing hydraulic cylinder mounted on box-type frame, the shaft that comes down to the connecting links to control the movement of the front wheels. It's easy to steer this big grader with hydraulic control.

THE GALION IRON WORKS & MFG. CO.
GALION - - - - - OHIO

The Galion Chief 3-wheel roller is shown above, 10- to 12-ton sizes. Also tandem, portable, trench and sheepfoot rollers. The No. 201 motor grader is shown at the right. Available with 50 HP diesel or 46 HP gasoline power—single or tandem drive.



Motor graders—full graders
Rollers—spreader
Grader blades

The T. L. SMITH CO., 2857 N. 32nd St., Milwaukee, Wis., U. S. A.



The new Lima Super-Paymaster.

New 3/4-Yard Shovel Announced by Lima

The Super-Paymaster, recently announced by the Lima Locomotive Works, Inc., Shovel & Crane Div., Lima, Ohio, is a $\frac{3}{4}$ -yard combination shovel, dragline, crane and pull shovel. When equipped as a crane, it has a 13-ton capacity; as a shovel it is equipped with an 18-foot boom and 15-foot dipper stick; and as a clamshell or dragline, its capacity depends upon the length of boom used and the material to be handled.

Among the features of the Super-Paymaster are proper balance, with the machinery and power plant placed to the extreme rear of the rotating frame so that greater capacities can be obtained without affecting the weight of the machine; hook rollers to relieve the center pintle of all digging shock; swing clutches of the internal expanding-band type, toggle-operated, with housings 17 inches in diameter and 6 inches wide; and a strong and stable crawler truck equipped to lock both crawlers from the operator's position. The crawler treads are 22 inches wide, with six-point connections, and 30-inch treads are available if desired. The boom is of all-steel box construction, electrically welded throughout, and the dipper stick is a single seamless type 7 inches in diameter. Friction is reduced to a minimum by the use of anti-friction bearings at all important bearing points, including drums.

Further information on the Super-Paymaster may be secured by those interested direct from the manufacturer by mentioning this magazine.

New Differential For 6-Wheel Trucks

A new power proportioning differential especially designed for six-wheel-drive trucks has been announced by the Four Wheel Drive Auto Co., Clintonville, Wis. This new differential is used in the power line, distributing the driving power to each axle in direct proportion to their normal loaded weight, and provides full differential action between the driving axes of the truck.

The basic principle of this new differential is similar to the common differential which divides the power equally, but differs in that the side gears have unequal radii, and the differential pinion gears are arranged to meet the unequal side gears. The ratio between the pinion and side gears operates as a continuous lever in such a manner that the same force applied on the shorter leverage of the differential side gear connected to the front axle reduces the torque applied to that axle while the same force applied to the rear leverage of the larger side gear connected to the two driving axles of the bogie. Since the balance secured is by gearing, it provides a continuous leverage.

Advantages claimed for this new dif-

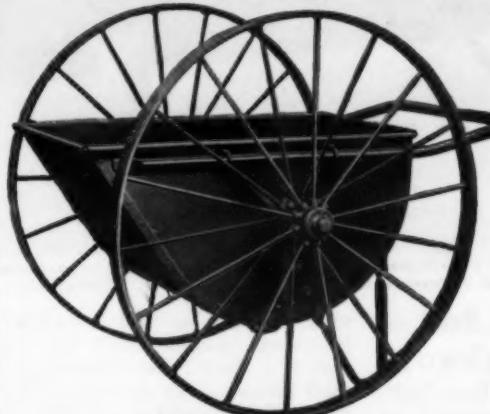
ferential are increased drawbar pull with free differential action, added hill-climbing ability; elimination of front-wheel spin; increased tire mileage; and lower operating and maintenance costs.

New 12-Yard Dump Unit

A 12-yard unit has recently been added to the Trail-Dump line of hauling equipment made by Koehring Co., 3026 West Concordia Ave., Milwaukee, Wis. With this increase in capacity from the older 8 and 10-yard units, Koehring has increased the strength of the body, made improvements in the automatic winding mechanism, and such other changes as were necessary for the larger load. The unit is powered with a two-cycle General Motors diesel engine, or a gasoline engine if desired.

Specification Sheet K163 describes these new Models T-120 and TD-120 Koehring Trail-Dumps. Copies will be mailed promptly by the manufacturer upon request to those mentioning CONTRACTORS AND ENGINEERS MONTHLY.

STERLING No. 6 CONCRETE CART



6 cu. ft. capacity
42" dia. wheels
12 gauge tray
Malleable Trunnions
With Plain or Roller
Bearings

A COMPLETE LINE
OF STERLING
WHEELBARROWS
AND CONCRETE
CARTS

STERLING WHEELBARROW CO., MILWAUKEE, WIS.



DEMPSSTER DUMPSTER TRADE MARK The Original BUCKETRUX

This is what many of the most successful operators are using to cut their loading and hauling costs—The All-Purpose Detachable Bucket providing the efficiency of an entire fleet with the costs of a single truck. Illustrated (top-center) is the new Model 300 LF (3 cu. yd. capacity) mounted on 117" wheelbase truck chassis. This powerful unit, like all Dempster-Dumpster units, will handle the Tilt Type and Drop-Bottom buckets (illustrated top left and right) as well as the Skip Type buckets, with equal efficiency. It can also be furnished with a combination cargo and transport body to increase its all-around flexibility. Note the large number of buckets in the background serviced by this one Hoisting Unit. One unit can serve five to ten buckets, depending on the length of haul. Special buckets engineered to meet all conditions. Investigate—Check with the operators who use them—Write us for details of our trial offer.

EXCLUSIVE FEATURES

- No High Pressure Hose
- No Counterweight
- No Auxiliary Jacks
- SIZES $1\frac{1}{2}$ cu. yds. to 6 cu. yds. CAPACITIES 4500-lbs. to 12,000-lbs. net Payload.



A DUMPSTER FOR EVERY JOB • A JOB FOR EVERY DUMPSTER

DEMPSSTER BROTHERS, INC.

KNOXVILLE
TENNESSEE

— DISTRIBUTORS IN PRINCIPAL CITIES —



Before steel guard rail posts were installed on the Pennsylvania Turnpike, a strenuous tug of war was staged between a wood and a steel post. P. S. Steel won.

New Type Guard Rail For Super-Highways

The new Bethlehem Safety Beam highway guard rail, recently announced by the Bethlehem Steel Co., Bethlehem, Penna., is considered to have special application on trunk routes and super-highways designed for travel at high speeds. Recently 17,000 feet of this new type of guard rail was installed on Ohio Route 7, just south of Gallipolis. Because of its channel design, the Bethlehem guard rail provides resistance to impact by its stiffness as well as its strength in tension, and eliminates the use of end anchors.

On the recently opened Pennsylvania Turnpike, Bethlehem Steel guard rail posts were installed, but before installation, a tug of war was staged between a wood and a steel guard rail post. The steel post was driven into the ground while the wood post was set in well-tamped earth of comparable compactness. In order to simulate closely service conditions, a typical fill on the highway itself was chosen as the location for the test.

When sufficient tension was applied to the connecting chain to cause the posts to tip appreciably, it is reported that the wood post had tipped $2\frac{1}{2}$ inches from the vertical as compared to a $\frac{3}{8}$ -inch tip in the steel post. With increased tension, the tip of the steel post was increased to 2 inches, at which stage the wood post had tipped $5\frac{1}{2}$ inches under the added tension. When the tip of the steel post was increased to $2\frac{3}{4}$ inches, the wood post completely yielded.

The steel post employed for the test was a standard Bethlehem B. S. 4 $7\frac{1}{2}$ -pound section. Steel posts of this specification were employed throughout the Pennsylvania Turnpike's guard rail installations.

Bigger Diesel Engine

To meet the requirements of the heavy hauling field, a new Model END-605 Mack-Lanova diesel engine has recently been announced by Mack Trucks, Inc., 34th St. & 48th Ave., Long Island City, N. Y. Similar in design and principle to the Model ED diesel, this new END-605 has a piston displacement of 605 cubic inches and a bore and stroke of $4\frac{3}{8} \times 6$ inches. It operates at the same maximum speed of 2,000 rpm and develops 144 hp.

One of the outstanding features of this new engine, as of all Mack-Lanova diesels, is the fact that it combines smokeless combustion with high power, high speed and smooth performance, according to the manufacturer. One of the reasons for this is that the Lanova energy cell in combination with the Mack combustion chamber design as used in this engine offers more thorough combustion and greater tolerance for different fuels. High grade pistons, rings, valves and liners resist wear and heat better and longer, it is stated. Permafit exhaust valve seat inserts prolong valve life. The valves are firmly guided and close accurately and evenly. The cylinders, which are of heat-treated alloy, do not distort and gaskets stay tight because of multi-studded and deep-section heads.

Other reasons for full rated power

without smoke are said to include the long-shank nozzles which are readily cooled, a Mack Synchrovance injection timer which reduces shock at low speeds, and a flange-mounted injection pump with fully-enclosed tamper-proof direct-gear-drive which prevents tinkering. The injection pump is a self-contained multiple unit protected against maladjustment in the course of ordinary en-

gine maintenance. Full scavenging and low pumping losses are effected by valves which open directly into the combustion chamber.

New Rivet Forge

The Hauck oil-burning rivet forge, made by the Hauck Mfg. Co., 124-136 Tenth St., Brooklyn, N. Y., weighs only 126 pounds, is easily carried anywhere and can be operated on staging or scaffolding. Of all-steel welded and riveted construction, it is rugged yet easy to handle. The top, sides and bottom are of extra heavy plate and its fire brick lining is easy to replace.

This forge produces a uniform rotating heat, burns fuel oil of 28 degrees Baume and lighter oils with compressed air from 30 to 120 pounds per square inch pressure. The manufacturer states that it produces white-hot rivets in three minutes from a cold start. It is charged from the top, with the rivets in plain sight. The patented furnace chamber is designed to vent all spent gases upward

WORK AHEAD OF SCHEDULE with MANITOWOC SPEEDSHOVELS



1 TO $2\frac{1}{2}$ CU. YARDS
write for
Bulletins and Complete Information.

SPEEDSHOVELS, of rugged and sturdy construction, are built of the highest quality materials by expert mechanics. They STAY ON THE JOB to increase production by eliminating delay time for costly repairs.

Manufactured by

MANITOWOC ENGINEERING WORKS, MANITOWOC, WIS.

BUFFALO-SPRINGFIELD



3-AXLE TANDEM ROLLERS
3-WHEEL ROLLERS

TANDEM ROLLERS
TRENCH ROLLERS

THE BUFFALO-SPRINGFIELD ROLLER CO.
SPRINGFIELD, OHIO

through a top opening, eliminating the air curtain and saving from 8 to 20 cubic feet of compressed air a minute, according to the manufacturer.

Literature describing and illustrating the No. 376 Hauck rivet forge may be secured by those interested direct from the manufacturer.

SPEED UP DEFENSE

WITH THIS EQUIPMENT . . .

RAPID PAVEMENT BREAKER

Speed . . . Economy



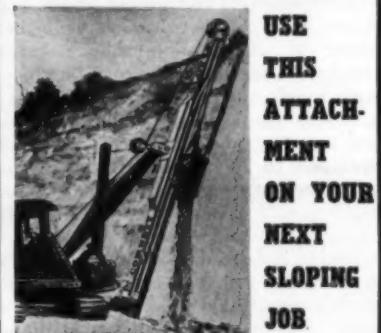
FASTEST PNEUMATIC CONTROLLED MACHINE

breaks frosted ground, concrete roads, trench. For tamping, post hole digging, bridge decks.

NOT A DROP WEIGHT

Used Extensively on State and Government Projects.

CORNETT SLOPER



USE
THIS
ATTACH-
MENT
ON YOUR
NEXT
SLOPING
JOB

- Slopes banks rapidly.
- Is easily attached to any shovel in an hour's time.
- Will cut any slope that a shovel can dig through.
- Is controlled entirely from operator's seat.
- Will cut through sand, gravel, soil, clay and broken rock in one operation.

MANUFACTURERS OF

HIGH

QUALITY

GUARANTEED

MOIL POINTS

and

CHISELS

CONCRETE CUTTING CORP.

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607 Degraw St., Brooklyn, N. Y.

Change of Address

(Mail to Contractors and Engineers Monthly, 470 4th Ave., New York, today)

From _____

(Old address)

To _____

(New Address)

Name _____

Rhode Island Road Made Wider, Safer

(Continued from page 19)

joints and completed his work by inserting a $\frac{3}{4} \times \frac{1}{2}$ -inch steel bar in the expansion joint slot on top of the cork joint material. This bar had off-set wings at the end to hold it in position on the forms. Following this, the boss finisher checked the surface with an 8-foot wood straight-edge, and then the two finishers broomed the surface and did the final edging.

The curing was done by placing Sisal Kraft paper over the slabs and leaving it for three days. The edges were carefully held down by rocks, and the ends of the strips of paper were weighted down with 2×4 's on which they were rolled for easy handling. The two men who handled the paper rolled it up in the morning for the section on which it had been spread for three days, and then unrolled it on the new concrete after it was finished and edged. No other curing was required by the specifications.

Bituminous-Macadam Center Strip

The 25-foot bituminous-macadam center strip was laid on the same 12-inch gravel foundation course as the concrete. This foundation course was rolled with a Buffalo-Springfield 12-ton 3-wheel roller, but the great amount of hauling by dual-pneumatic-tired trucks over this section gave it an unusually thorough compaction. On this foundation course a layer of base stone from 1 to 4-inch screen size, brought in from the Slocum plant at the rate of 750 tons a day, was spread by a Caterpillar No. 10 grader with two men in back spotting. This was rolled to a $5\frac{1}{2}$ -inch compacted layer and filled with crusher dust from Gammino's Lincoln quarry, with two men hand-brooming the dust during the rolling to fill the voids completely. The rolling was done by two 14-ton Buffalo-Springfield 3-wheel rollers. To speed up filling the voids the surface was sprinkled with water from a 500-gallon tank mounted on a Ford truck and equipped with a 2-inch Gorman-Rupp pump.

The $2\frac{1}{2}$ -inch layer of top stone of $1\frac{1}{2}$ to $2\frac{1}{2}$ -inch screen size was hauled from Gammino's Lincoln quarry 30 miles away, at the rate of 500 tons a day. Twelve trucks were used to haul top stone, two for hauling $1\frac{1}{2}$ to $\frac{3}{4}$ -inch chip stone and two hauling stone dust. The fleet was comprised of eight Macks, three Internationals, three Diamond T's, and two Sterlings. The top stone was spread by dumping into an Adnun Black Top paver which was able to handle a larger volume than the usual stone spreading box. Three men spotted the high and low spots and then two 14-ton Buffalo-Springfield rollers compacted the material. This was penetrated with 1.75 gallons of 85 to 100-penetration Socony Binder C applied by Kinney distributors. Then the surface voids were filled with the $\frac{1}{2}$ to $\frac{3}{4}$ -inch keystone distributed by a Buckeye spreader. The chip stone was stored in stockpiles along the job prior to this work. The keystone was rolled to firmness and promptly sealed with $\frac{3}{4}$ -gallon per square yard of the same asphalt and covered with $\frac{1}{2}$ -inch stone, using the mechanical spreader. A total of four 14-ton rollers were used throughout this work.

It had been the intention of the contractor to carry the bituminous paving along with the concrete, but the demand for base stone was so great at the gravel plant that insufficient stone could be supplied. Therefore, the bituminous macadam paving was left until last when the stockpile at the pit had grown to a sufficient size so that the stone could be delivered in sufficient quantities each

day to maintain a good progress schedule.

Roadside Work

All of the sand slopes in cuts were loamed and planted with honeysuckle vines eventually to cover the slopes and bind the sand to prevent washing. Holes 24 inches in diameter and 18 inches deep were excavated over the face of the slope and filled with loam in which the honeysuckle was planted. All other shoulders and adjacent areas were loamed and sown with grass seed.

Major Quantities

The major quantities on this \$288,169.02 contract given below is an indication of the magnitude of the various operations.

| | 9.66 acres | |
|--|------------|----------------------|
| Clearing and grubbing | 79,313 | cubic yards |
| Earth excavation | 5,844 | " " |
| Trench earth excavation, 0 to 5 feet | 35 | " " |
| Trench earth excavation, 5 to 10 feet | 13,158 | " " |
| Rock or ledge excavation (larger than a $\frac{1}{2}$ -yard boulder) | 350 | " " |
| Trench ledge excavation | 204,650 | " " |
| Trimming shoulders, side slopes and fine-grading the sub-grade | 2,449 | " " |
| Stripping and piling loose | 8,434 | " " |
| Furnishing and placing loam | 51,638 | " " |
| Gravel foundations | 13,937 | tons |
| Crushed gravel base course for penetration macadam | 3,484 | " |
| Stone dust filler for base course | 7,329 | cubic yards |
| Gravel base course for shoulder pavement | 10,035 | tons |
| Crushed stone in place for bituminous macadam surface | 139,375 | gallons |
| Bituminous binder applied in place | 10,902 | cubic yards |
| Reinforced concrete pavement | 17,936 | barrels |
| Portland cement for pavement | 14,296 | pounds |
| Steel bar reinforcement for "U" bars and expansion joints | 18,044 | " |
| Dowels for expansion joints | 52,166 | square yards |
| Steel fabric reinforcing | 43,976 | " |
| Bituminous shoulder paving | 62,385 | gallons |
| Furnishing and applying seal cut on bituminous macadam | 1,000 | feet |
| 8-inch vitrified clay pipe sub-drain in stone trench | 2,610 | " |
| 12-inch vitrified clay pipe sub-drain in stone trench | 1,308 | " |
| 12-inch Class A reinforced concrete culvert pipe | 55 | " |
| 18-inch Class A reinforced concrete culvert pipe | 90 | " |
| 24-inch Class A reinforced concrete culvert pipe | 4,948 | " |
| 12-inch Class B plain concrete culvert pipe | 2,072 | " |
| 18-inch Class B plain concrete culvert pipe | 1,044 | " |
| 30-inch Class B plain concrete culvert pipe | 22 | " |
| 8-inch Class B plain concrete culvert pipe | 94 | " |
| 12-inch Lock-Joint cast iron pipe for extensions | 416 | " |
| 18-inch spiral corrugated iron pipe for extensions | 551 | " |
| 18-inch Lock-Joint cast iron pipe | 18 | " |
| 24-inch spiral corrugated iron pipe | 9 | " |
| Drain inlets | 8 | " |
| Catch basins | 74 | " |
| 8-inch vertical brick wall for catch basins | 435 | vertical linear feet |
| Stone masonry | 361 | cubic yards |
| Dry rubble masonry | 8,349 | linear feet |
| Cement concrete curb | 11,109 | feet |
| Pre-mixed bituminous-concrete sidewalk | 3,802 | square yards |
| Removing and disposing of reinforced-concrete pavement | 7,779 | cubic yards |
| Seeding | 43,316 | square feet |
| Honeysuckle | 14,862 | vines |
| Furnishing and delivering seed | 1,341 | pounds |
| Furnishing and delivering fertilizer | 9,725 | " |

On this contract there were almost 6 miles of drainage pipe installed to insure a dry subgrade at all times.

Personnel

The 3.8-mile dual pavement contract at Nooseneck Hill, Rhode Island, was

awarded to M. A. Gammino Construction Co., of Providence, R. I., on its low bid of \$288,169.02. During heavy grading Al Gregory was Superintendent for the contractor, and during paving J. F. Ableman was Superintendent. Gunnar A. Croft was Assistant Superintendent throughout the work. H. R. Davis was Resident Engineer for the Division of Highways of the Rhode Island Department of Public Works.

New Bolt Anchor Has Many Applications

Something new in a bolt anchor, known as the Rawl Hammer-Set, has a number of applications in the construction field, such as anchoring facing to bridge structures or piers, for temporary or permanent anchoring of guy wires, for carrying temporary wiring in tunnels and subways, and similar uses.

The Hammer-Set is a two-piece unit consisting of a sleeve and a nut held together by precision taper friction. The sleeve is formed of one vertical slot extending its entire length which opens or closes according to variation in the diameter of the hole in the masonry. As the normal diameter of this sleeve is greater than the nut, it simply contracts when driven into a normal hole, locking the nut in position at any depth desired. As the nut is drawn further into the sleeve by tightening the bolt, it increases the radial contact with the walls of the

hole. The tighter the bolt, the greater the engagement. No caulking is required; a few blows of the hammer in driving the sleeve into the hole is all that is necessary.

It is claimed that the anchor, when locked, can not move vertically or horizontally, the sides of the anchor always remaining parallel with the wall regardless of the position of the nut or the expansion of the sleeve.

The Rawlplug Co., Inc., 98 Lafayette Street, New York City, manufacturer of the Hammer-Set, will be glad to send complete details and prices to interested readers of this magazine.

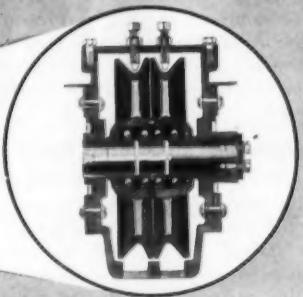
FINISHING MACHINES

JOINT INSTALLING MACHINES

Flexible Road Joint
Machine Co.
WARREN, OHIO

BLAW-KNOX BUCKETS have

SEALED
BALL BEARING
SHEAVES

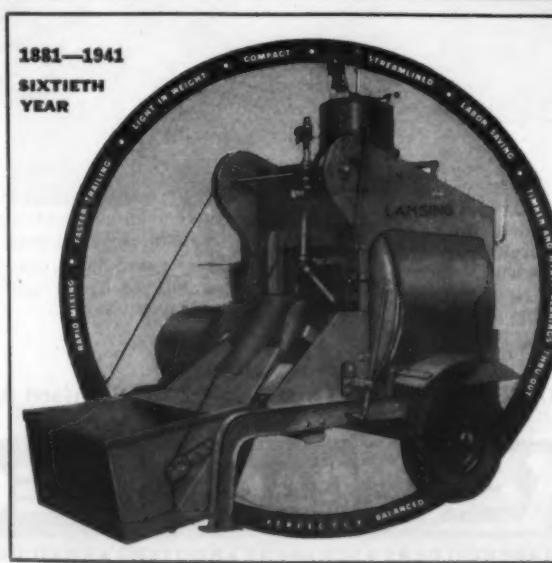


Sealed ball bearing sheaves in the lever arm reduce lost time and expense of bearing replacement, increase cable life and reduce friction, materially improving operating efficiency. This, and many other better features, that make BLAW-KNOX the "wise" buy in buckets are fully explained and illustrated in NEW CATALOG 1757. Send for your copy today.

BLAW-KNOX DIVISION
of Blaw-Knox Company
Farmers Bank Bldg. Pittsburgh, Pa.

BLAW-KNOX BUCKETS

BLAW-KNOX BINS AND BATCHES • ROAD FORMS • STREET FORMS • CONCRETE SPREADERS • ROAD FINISHERS • VIBRATORS
CONCRETE BINS • CONCRETE SPREADERS • CONCRETE VIBRATORS • CONCRETE FINISHERS • CONCRETE SPREADERS • CONCRETE FINISHERS • CONCRETE VIBRATORS



Announcing Lansing No. 7-S Mixer

Lansing offers you a new, easy towing, two-wheel sturdy mixer—with power loader, 12-gal. water measuring tank, big mixing drum, 4-cylinder air-cooled LeRoi engine and capacity of 8-12 cu. yds. per hour.

WRITE FOR NEW FOLDER WITH DETAILS OF
the NEW 7-S MIXER

LANSING COMPANY

LANSING, MICHIGAN

CHICAGO SAN FRANCISCO KANSAS CITY NEW YORK BOSTON MINNEAPOLIS PHILADELPHIA

Snow Removal Vital To Defense Program

(Continued from page 43)

snow. The greatest interruptions to highway traffic are caused by icy pavements and snow drifts, and on rare occasions, by storms and floods.

The northern half of Illinois is well within the snow belt. Annual accumulated falls average from 20 to 40 inches or more over this area. High winds, sweeping across the flat, open prairies pile even a light snowfall into drifts that interfere with traffic. Heavy snowfalls in quiet air cause but little trouble. There have been repeated instances where a blanket of light, loose snow, lying on the fields, has been piled into impassable drifts on the roads by high winds when there was not a cloud in the sky. It is the combination of high wind and loose dry snow which causes snow drifts, rather than a large total of inches of snowfall. Icy pavements vary from packed snow to clear water ice. The packed snow can often be graded off. Water ice under severely cold temperatures is as yet an unsolved problem as regards removal. Advantage is taken of any softening period during the short winter days to scrape off as much ice as possible. Illinois has many periods of freezing at night and thawing by day that cause hazardous driving conditions. The scattering of abrasive materials has been found to be the most practical means of control. During severe cold spells, the ice must be cindered or sanded over and over again at the same places to replace the abrasives that are brushed off by traffic.

Organization to Combat Snow

To keep the highway traffic running smoothly, arrangements are made to combat the expected storms in advance of their arrival. Snow fence is erected at locations where experience has demonstrated that drifts will occur. Stockpiles of cinders, sand, abrasive materials, and ice-softening chemicals are stored at convenient points from which they can be easily loaded into trucks and scattered over icy pavements, at railroad crossings, sharp curves, steep hills, and paved highway intersections, to improve the traction of the wheels of the vehicles.

In each of the ten highway districts, the state roads are divided into convenient maintenance sections of suitable length and to each section is assigned a snow-removal unit with personnel of regular driver and helper, relief drivers and helpers, and other workmen, as may be required to keep the road open to traffic. A few units are held in reserve for replacements of any unit which may become disabled, or is found to be inadequate to keep up with the condition on its assigned piece of road. The sections assigned to each piece of heavy-duty equipment may overlap the regular patrolman's section, according to the effectiveness of the individual unit assigned to that road.

The mechanics in the district garages and shops are prepared to make repairs at all hours of day and night. Extra supplies of tire chains, snow plow blades, and all other repair parts which past experience has taught will be required are stocked for emergency use.

Headquarters points for supervisory personnel are selected and arrangements made so that communication from field forces to district and state headquarters is made at regular intervals by reliable men. Experienced men are assigned to the headquarters of district and general highway offices to transmit information to interested parties, newspapers, and broadcasting stations. The object is to have an organization which will go into action within an hour's time, day or night, whenever snow storms or ice for-

mations occur, and keep going day and night as long as the emergency exists.

Effective assistance in the control of highway traffic during emergency is also rendered by the state highway police force. The officers of this organization give helpful assistance in the management of traffic, prevention and breaking up of traffic blockades, and in the warnings which they give to the public of conditions along the highways. The police radio system is also effectively used in the transmission of information not only concerning the condition along the highways, but also concerning equipment and personnel operating within the storm area.

The method of control of the snow removal organization is sufficiently flexible to permit a rapid shifting of personnel and equipment to the roads most affected by the storms. In general, the roads affected are those which lie nearest to right angles to the direction of the winds that prevail during the storm. For instance, if the storm comes from the west, the roads on which the greatest snow drifts occur will be the north and south roads. If the wind comes from the north, the drifts will form on the east and west roads.

Previous experience has also shown that snow storms in this state seldom cover a territory more than 150 to 200 miles wide. In unusually severe storms when the progress of the storm indicates that the storm center is fixed and that it will not shift materially, snow plows from areas outside of the storm center can be shifted to assist local snow-removal units. It is necessary, however, to exercise the best judgment derived from previous experience to avoid the danger of stripping an outside territory of plows, thus leaving it exposed should the storm center shift into the area from which the plows have been taken away.

Public Plays a Part

Cooperation of the drivers of private cars, buses, and trucks is an essential factor in preventing snow drift blockades. It is extremely difficult for the best of snow plows to operate on a highway which is cluttered up with huge trucks, buses and cars, stalled on the pavements. Frequently, especially on the two-lane highways, more time and effort is spent in clearing the road of traffic so that the plows can operate than in the actual plowing of the snow itself.

In Illinois, the snow and ice storms often strike suddenly and without warning, sometimes following a number of days of mild weather that induces people to drive out unprepared for severe conditions. Drivers of trucks and cars should be careful to see that their vehicles are always properly equipped. All trucks and cars in use through the winter should carry a serviceable set of tire chains and adequate supplies of gas and oil; lights should be in good condition, and each car, bus, and truck should carry a good jack, at least one shovel, and a tow rope or chain. These simple precautions on the part of the public will often prevent blockades of the highways by stalled traffic and will permit maintenance crews to break through snow-drifts more rapidly.

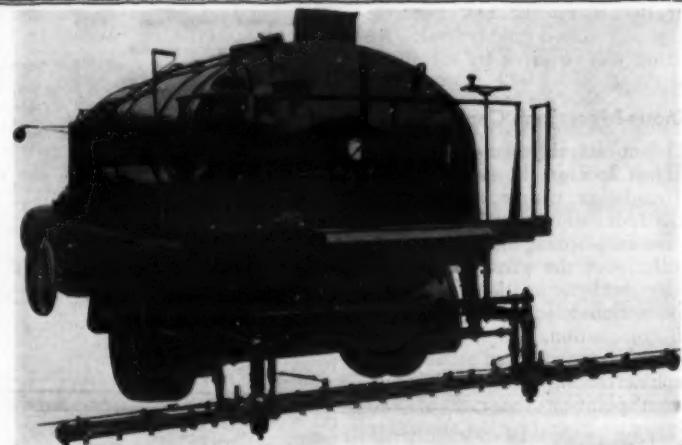
Conclusion

This analysis shows that the problem of cooperation of the State Highway Department and the national military organization in Illinois also coincides with

the requirements of general civil and commercial use. A further thought is that a number of the army's own motor units should be equipped for snow-removal work to expedite their movements over county and township roads that are not under the State Highway Department's jurisdiction, and to insure their routes of travel should the highway's organization and equipment be insufficient for the task.

Pump Corrosion Problems

"Practical Pumping Problems and How They Are Solved" is the title of a 16-page folder recently issued by the International Nickel Co., 67 Wall St., New York City, containing comprehensive information on pumps and pump parts. The uses of Monel, K Monel and S Monel for pump parts in applications where there is need for high resistance to corrosion, wear, pitting, or scoring are discussed and much attention is given to performance.



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BULLDOZERS • GRADEBUILDERS • SCRAPERS • ROOTERS • ROAD DISCS • MAINTAINERS • SNOW PLOWS



The new Jaeger 8-yard truck mixer.

Giant Truck Mixers Just Put in Service

A fleet of giant truck mixers, the world's largest transit concrete mixers, which provide 8 cubic yards payload, equal to 16 tons of mixed concrete, have just been put in service by the Colonial Sand & Stone Co., Inc., New York City. These were developed by the Jaeger Machine Co., 720 Dublin Ave., Columbus, Ohio, based on the successful New York Special 5½-yard model, over 150 of which are being operated in New York City. These giant mixers are of additional interest because of the recent development in concrete paving, using truck-mixed concrete and a concrete spreader, a combination which has proved successful on several jobs.

The complete mixer unit, mounted on a 6-wheel truck powered with a 150-hp diesel engine, stands 12 feet high, is approximately 26 feet long, and weighs 31½ tons when fully loaded. The mixing drum is driven direct from the truck engine and, by means of the Jaeger vacuum control, the operator is able to start and stop the 16-ton load of the revolving drum merely by flipping a valve at the steering wheel. The drum is equipped with two top charging doors. After enough material to produce 5 cubic yards of concrete is received through the first door, the machine moves forward to bring the second door under the charging hopper where the remainder of the 8-yard batch is received.

The total capacity of the water tank is 325 gallons, consisting of mix, flush and tempering water, all of which are controlled from a single Uni-Valve panel on the tank. A special aluminum accuracy chamber encloses the siphon shut-off in the tank so that accuracy of water measurement can not be affected by splashing or surging of the main body of water.

New Earth Scraper Has Double Bucket

Designed to give increased yardage with D8 tractor power, the new Model LU Carryall cable-controlled scraper, recently announced by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif., has a struck capacity of 15 and a heaped capacity of 19 cubic yards.

Because of its large capacity and easy

GRACE TWO-WAY ROAD SWEEPER



Also the
RAPID FIRE HEATER
for Tank Cars of Asphalt
DRAG BROOMS

Write for literature

W. E. GRACE MFG. CO.
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Texas

loading, it is stated that the Model LU can be used with a standard D8 tractor and loaded either with or without a pusher. An 8-foot 6-inch blade width permits moving the scraper over highways as well as its operation on narrow fills.

The patented double-bucket feature incorporated in the Model LU gives the effect of loading two small Carryalls successively. After the first bucket is loaded to capacity, it is permitted to travel back on rollers instead of being forced, thus reducing loading resistance and giving larger possible loads for expended tractor effort. The second or front section of the bowl is then easily heaped high with D8 tractor power. The cutting edge of the bowl is only 8 feet 6 inches wide, giving increased power applied to each linear foot of blade. High sides prevent boiling over, and a new apron design increases capacity, reduces overflow, and facilitates loading by reducing entrance friction.

The positive-ejection tail-gate gives accurate control of spread, and empties

the bowl quickly. Single dead-ended cable on either side of the bowl pulls the tail-gate from the vertical load center. To keep the sheaves entirely free from dirt, the cable is dead-ended on the apron and a sliding block sheave assembly mounted on the spring pipe. A goose-neck or swan-neck yoke gives increased clearance for large single or dual tires when working over uneven ground. With a special yoke assembly, the Model LU

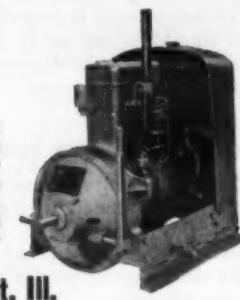
can be quickly converted from a tractor-drawn unit to one for use with the Model B Tournapull.

In order to make the Model LU adaptable for all types of job conditions, it may be equipped with a large variety of tire sizes. The front may have two 13.50 x 20's or two 18.00 x 24's; and the rear either four 13.50 x 20's, two 18.00 x 24's, two 18.00 x 40's, or two 24.00 x 32's.

STOVER Two Cylinder Lanova DIESEL ENGINES Are Now Ready

Smoother running. More power per cubic displacement and per pound, with proportionate lower cost. Available in 4 sizes and a variety of mounting bases. 7½ and 10 H.P. models are single cylinder. 15 and 20 H.P. are twin cylinder. Illustration shows conventional stationary type. Twin cylinder models have No. 1 Bell housing. Write Dept. D93A for Bulletin No. 51 with complete information.

STOVER MFG. & ENGINE CO., Freeport, Ill.



TO SPEED-UP DEFENSE CONSTRUCTION



Among many major government projects in which hundreds of tons of calcium chloride have been used are the Grand Coulee and Bartlett Dams. Photo here taken at Bartlett Dam by the U.S. Bureau of Reclamation and reproduced through its courtesy.

Write for Brief 155 and for Specifications
and Data on Use.

USE CALCIUM CHLORIDE IN COLD WEATHER CONCRETING

Why lose days and weeks waiting for slow winter concrete to gain safe strength. Get the fast action of normal 70° summer placement temperatures into your concrete mix with calcium chloride. Calcium chloride produces safe strength in half the time, permits succeeding placements to go forward, releases forms, gets concrete ready for finishing, cuts days out of winter concrete schedules. 25 years of field use and long research tests by the National Bureau of Standards and other authoritative bodies show that the addition of calcium chloride gives concrete better strength at all ages. It is ideal to speed work in housing projects, pavements, fortifications, factory building and the numerous major construction projects required by the defense program.

CALCIUM CHLORIDE ASSOCIATION
4145 Penobscot Building, Detroit, Mich.

CALCIUM CHLORIDE
YEAR 'ROUND CONCRETE CONSTRUCTION

Defense Work Best Done by Contract

(Continued from page 39)

Authority should be a part of the PRA, but with the power to sell these bonds. Banks which are now bursting with money would purchase and distribute these bonds, which should be issued for 50 years. As the roads are finished and the revenues begin to come in, a sinking fund should be set up to amortize the bonds. In other words, private capital would furnish every cent of the cost of this proposition.

Method of Handling Defense Work

The huge defense program now under way is an emergency program, in which speed is a vital factor. Every loyal American wants to help and also desires to see the program carried out with the greatest efficiency and dispatch. In the realization of this program, the construction industry is not only ready and willing but also is organized and equipped to carry out the tremendous construction program involved in total defense with speed, skill and economy.

Generally speaking, both the Army and Navy wish to use to the utmost the facilities of the construction industry. But in many cases there isn't time to prepare in advance the complete designs and specifications necessary to award contracts on the lowest responsible bid basis.

For this reason, the Quartermaster General of the Army has announced a procedure for a cost-plus-a-fixed-fee arrangement, whereby a contractor or group of contractors, registered with the Quartermaster Corps and recognized to be responsible and equipped to handle the particular job at hand, is invited to do the work on a cost-plus-a-fixed-fee basis, the details of which were outlined in the September issue of CONTRACTORS AND ENGINEERS MONTHLY on page 26.

A similar policy has been adopted by the Navy Department, under which the work is inaugurated on terms of the Navy estimates, with a pre-determined fixed fee allowed the contractor for his services, plant and organization. It is believed that under this arrangement the contractor has more incentive to drive to an early completion of the work in hand, since his earnings are not governed by the actual cost of the work or any other factor than the desire to complete it as soon as possible. In embarking on this program, the Navy Department is using every effort to establish in its contracts a working basis that is conducive to efficiency, speed and economy, and recognizes that the attainment of these objectives requires team-work between the Government and its contractors.

In the matter of subcontracts on Government projects, the method of selecting the subcontractors and the basis of their compensation are determined for each case jointly by the Government and the general contractor. A statement prepared by W. H. Harrison, Director of the Construction Division, National Defense Advisory Committee, says:

"Underlying the whole defense con-

struction program and particularly those projects handled on a cost-plus-a-fixed-fee basis, is the intention that the work not only shall be done soundly, expeditiously and economically but that it shall be done with due regard to the generally accepted methods and procedures currently followed in the construction industry; provided, of course, that such conforming is consistent with the primary object of the national defense program, namely to build up the nation's defenses in the shortest practicable time."

Speaking for the construction industry, we believe that it will demonstrate, not only that the contract method is consistent with the objectives of the defense program, but that it is in the main the *only* efficient way to attain those objectives.

In his address to the American Association of State Highway Officials, Thomas H. MacDonald had this to say on the policy of carrying out our defense highway program:

"This final statement of policy is held

to the last to accent its importance. The road-building organization of the state highway departments must be used to carry on the active engineering and supervision of whatever program of defense highway improvements is undertaken. It will be the policy of the Public Roads Administration to hold steadfastly to the same type of cooperative relationships that have proven effective in the past, and that must be relied upon now. The greatest service that the state highway departments can render at the present time is to enter wholeheartedly into the common cause—that of national preparedness. From my contacts with the organizations and the individuals composing them over a long period I have full faith that their response will be prompt and generous and in the spirit of national unity."

Since the policy of the state highway departments in the past has been to carry on all highway and bridge construction and reconstruction by contract, it is logical to assume that future work will be done in the same manner, since

the highway contractors of the United States have already proved their ability to handle this type of work most efficiently and economically.

The Industry Is Ready

Last August the late Edward J. Harding, Managing Director of the Associated General Contractors, issued a statement in which he said that the construction industry was equipped and prepared to perform all national defense construction with the necessary speed, quality and economy. Mr. Harding pointed out that while proposed work indicated a total defense construction program of approximately \$1,500,000,000 to be started in 1940 and 1941, in terms of yearly volumes of construction that is only about one-eighth of the present yearly capacity of the construction industry.

A survey made by the AGC revealed that the present capacity of the construction industry is approximately \$12,000,000,000 a year. The total vol-

(Concluded on next page)



TARVIA



FOR DEFENSE



Engineers and contractors with time schedules to meet for airport, cantonment and industrial paving can profit by The Barrett Company's experience in successfully solving similar problems during 1914-18. Barrett has the personnel and equipment to speed up defense construction—specially trained highway engineers, a fleet of Barrett tank cars and efficient Tarvia distributors, and a nationwide network of Tarvia plants. It's a big organization equipped to meet big emergencies!

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Endorsed and Adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy and accuracy guaranteed.

SAND'S LEVEL & TOOL CO.
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Construction Ready To Aid in Defense

(Continued from preceding page)

ume of construction for 1939 was approximately \$9,947,000,000. It was estimated that in 1940 an increase in the amount of private construction would be more than balanced by the decrease in public construction so that the total volume, including defense construction, would not exceed the 1939 total.

"The defense construction program offers nothing in size which the construction industry can not easily handle," Mr. Harding said. "The general contracting branch of the industry has the central responsibility for coordinating all the facilities of the industry, and for actual construction of projects. The AGC has found that there are enough competent adequately financed contractors so that general contracting will become no bottleneck."

The AGC survey accounted for approximately 2,600,000 construction workers, entirely adequate for an annual volume of \$12,000,000,000. Plant and equipment owned by contractors has been conservatively estimated at \$500,000,000 at its present depreciated value, not at its replacement cost.

Although much of the defense construction may be located in out-of-the-way and sparsely inhabited locations, the construction industry is by its nature a mobile industry, for it is a normal procedure to construct unusual projects in unusual locations.

"The type of cooperation which the construction industry has already given the Government in the defense program is illustrated in a report of Secretary of Navy Knox at a press conference on August 7," Mr. Harding pointed out. "Secretary Knox said that the construction of naval air bases in the Pacific had progressed at so rapid a rate that they would be ready for use months ahead of the time fixed in the construction contracts."

Manufacturers Also Ready

For the past 10 years, the manufacturing facilities of this country have been operating well below their established capacities, and for the most part manufacturers of construction equipment are entirely prepared to meet the demands of defense construction projects. Since all the proposed construction is still within the total yearly volume for which the construction industry is prepared, there should be no delays due to lack of ability on the part of manufacturers to provide the necessary equipment to carry on.

Reports from the leading manufacturers of construction equipment indicate that careful surveys of plants and capacities have been made, and although no need for great expansion has been seen thus far, plans are already being made to meet any such requirements. As J. L. Lincoln of Lincoln Electric Co. put it, "if Government will merely leave the manufacturer alone without interference, without sabotaging labor and without passing new regulatory legislation, American industry can do the same kind of job it has always done, and that is the best job that has ever been done in any nation in the world and certainly one which is sufficient for any requirement."

In a statement on its policy as far as defense production is concerned, the American Chain & Cable Co. said:

"American industry stands ready and anxious to meet the challenge of preparedness. No country in the world enjoys a higher order of skilled craftsmanship, of production facilities, of technical ability or of efficient management. Not only have our industry and our creative ability given to the world a

generous portion of the implements conducive to the fuller life of peaceful men, but our ingenuity has laid the cornerstone of major technological advances.

"Now these proven capacities of American labor and industry must be put to work in the interests of America. Industry must be mobilized; man power must be generated; production must be accelerated into the greatest concentrated drive in our history.

"Our job is to create an impregnable America—an America so imposing in its military might that no nation or group of nations would dare to violate its sovereignty or to prejudice its peaceful pursuits.

"But the test of preparedness is not to be found in words or blueprints; preparedness rests on the capacity and the ability of our factories to turn out quickly whatever is needed. . . . America's labor and industry have that capacity and ability."

Build for Defense!

When Winston Churchill told the people of Britain that he had nothing to offer but "blood and tears, toil and sweat," he sounded the keynote for free people all over the world. Here, we are at present spared the "blood and tears" but if we are to be secure, we must adopt freely and willingly the "toil and sweat."

One of the country's largest industrial concerns, now engaged in production for national defense, recently called upon its employees to make their liberties secure through work. A. W. Robertson, Chairman of the Westinghouse Electric & Mfg. Co., declared that work, not words, will preserve our nation and that unless we work now to a purpose, we may not be able to talk later.

"Unless we work now as free men," Mr. Robertson said, "we may work soon as ordered. Other peoples were not warned in time. Holland is gone. Belgium is gone. France is gone. For us there is still time—if we work."

Build for defense! Before us lies a tremendous program, perhaps the greatest this country has ever launched, and the construction industry will play its part in that program, as it has in the past played its part in the development and progress of this country. Less spectacular than some services, the construction industry is most vital because it must build the foundations on which an adequate defense can rise to make this country secure.

The cry is for a motorized and mechanized army, larger and faster and

stronger than any that can threaten us—but before that army can function, an army of tractors and graders and excavators and pavers and experienced road builders must provide the highways and bridges over which motorized units can travel without bogging down.

Fifty thousand planes! Not so spectacular but of vital importance are the equipment and the men to provide the airports from which these 50,000 planes can operate.

Work, not words, will make America secure.

Cofferdam Practice

By Eminent Authors

A treatise on the theory and practice of cofferdam construction, by Lazarus White and Edmund A. Prentis, has recently been published by the Columbia University Press, New York City. As Edwin M. Markham, former Chief of Engineers, U. S. Army, notes in his foreword, "To date . . . conclusive literature

on scientific cofferdam design has been lacking." The authors have filled this need by preparing an authoritative study, starting with illuminating laboratory and scale demonstrations of the hydrodynamics of cofferdams and studies of lateral earth pressures. They have furnished a wealth of facts on land and conventional cofferdams, with a chapter devoted to practical considerations of construction, including borings, streamlining, closure, berm protection, and pumping. The concluding chapter on "Examples of Cofferdams" is most comprehensive, and offers to the reader a wide variety of problems, with discussions of the methods of overcoming them.

Cofferdams should be in the library of every contractor as a companion volume to *Underpinning*, by the same authors and publishers, which also is priced at \$7.50.

Be up-to-date! Read the descriptions of new equipment in this issue and write for further details.

FOR LOW BIDS

LOADED WITH PROFIT

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Mall
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Gasoline engine, air and electrically-operated tools and attachments to meet every requirement efficiently and economically.

Any contractor can figure profitable job-winning bids with MALL Portable Power Tools that keep all types of concrete construction on a low-cost basis. The 3-H.P. Vibrator, illustrated above, operates all day on 1½ to 2 gallons of gasoline—saves material by permitting use of coarser aggregates and enables one man to place concrete better and faster than 5 hand puddlers. In addition, it packs concrete firmly against forms eliminating voids—assures better bond with reinforcement and earlier stripping of forms. The interchangeable attachment feature makes it quickly convertible for Surfacing, Sawing, Sanding, Wire Brushing, Grinding, Pumping, Drilling and Sharpening Tools.

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NEW 1941 Catalog of Contractors' Equipment

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Speed Up!

NATIONAL DEFENSE ROADS

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TRADE MARK
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"SPRAY MASTER" PRESSURE DISTRIBUTOR

IT'S speed we need in this National Defense Road Building Program, and it's speed of operations that makes Littleford Road Equipment right in step with this program. The Littleford Pressure Distributor, "Tankar" Heater, and Road Broom give patented features that are found only in Littleford Units. Single Valve Control on the Pressure Distributor, High Speed Steam Producing Steamer on the "Tankar" Heater, and the Hydraulic Ground Clearance on the Road Broom, are designed to cut operating time and guarantee speed up operation. When you purchase Black Top Road Equipment be sure it bears the Littleford Trade Mark.

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LITTLEFORD ROAD BROOM

"TANKAR" HEATER

LITTLEFORD ROAD BROOM

LITTLEFORD ROAD BROOM

LITTLEFORD ROAD BROOM



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415 E. Pearl St.,
Cincinnati, Ohio

Electric Magnets Clean Highways in Missouri

A magnet mounted on wheels and designed to rid highways of nails, bolts and other objects that cause tire blow-outs and automobile accidents has been designed and built by the Missouri State Highway Department at a cost of \$4,000.

The device carries three powerful electric magnets, each of which will cause a 3-pound object to leap as far as 4 inches. The magnets are suspended from the chassis of a 2-ton truck, and a generator, mounted on the chassis and driven by a

separate engine, supplies the current. The magnets are most efficient when adjusted to 4 inches above the pavement surface, with the truck traveling at 10 to 12 miles an hour, according to the Highway Department. On an average, the magnets pick up 4½ pounds of iron objects per mile of travel.

Pressure-Creosoted Poles

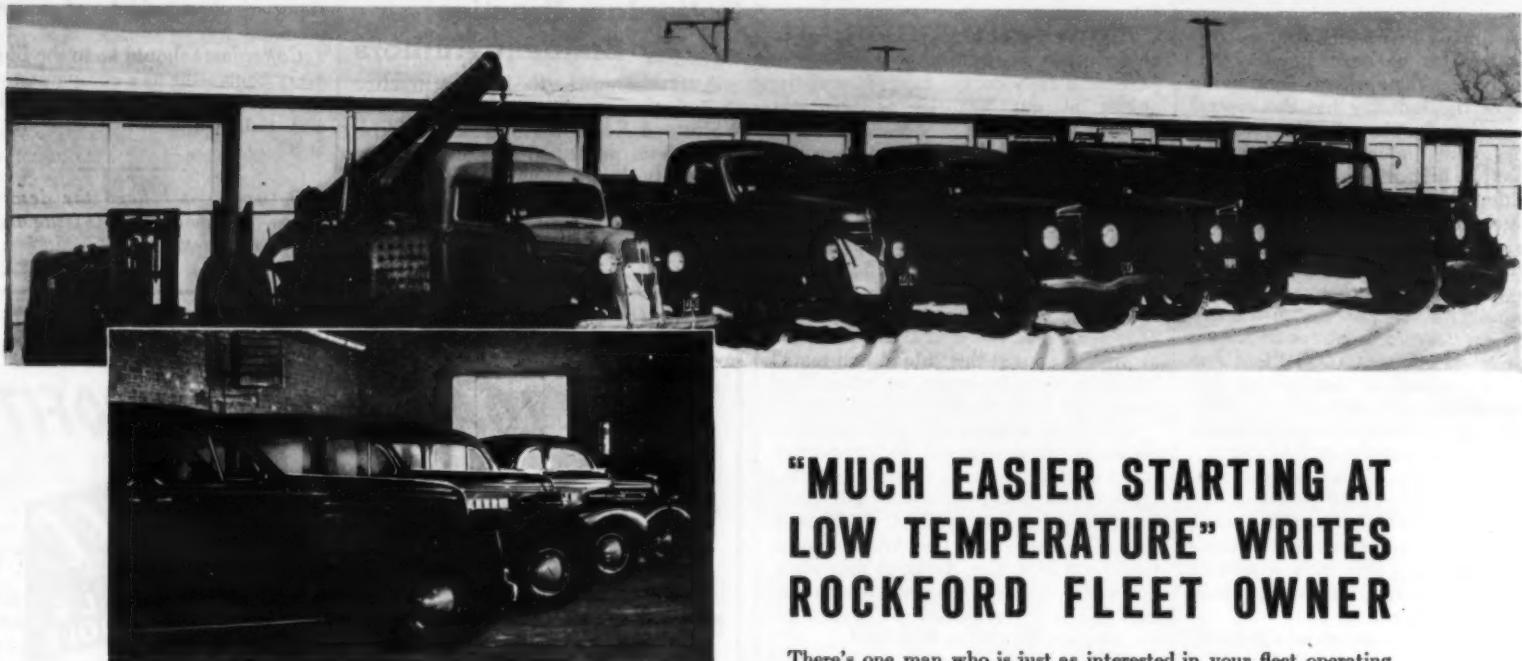
Comparative costs and life of treated and untreated poles, a discussion of their specifications and use, and tables showing characteristics and sizes of

various species of pole timber are among the subjects covered in a 20-page booklet, Form G-15, just published by The Wood Preserving Corp., Pittsburgh, Penna., a Koppers Co. subsidiary. A graph and cost examples compare the annual cost of treated and partially treated poles, and recommended standard specifications for pressure-creosoted southern pine poles as well as for the creosote used in their treatment are given.

Copies of this booklet may be obtained by those interested direct from the manufacturer.

New Illustrated Bulletin On 1/2 to 3/4-Yard Shovels

With 67 photographic illustrations, Bulletin No. 2066 recently released by Bucyrus-Erie Co., South Milwaukee, Wis., tells the on-the-job story of ways in which contractors are using ½ to ¾-yard B-E power shovels. Virtually every phase of excavating, grading and dirt-moving operations is represented; the machines are shown operating as shovels, drag shovels, skimmers, drag-lines, clamshells and cranes on a wide range of actual jobs.



Part of the fleet of officials' cars and trucks operated by Greenlee Bros. & Co., machinery and tool manufacturers, Rockford, Illinois. The Standard Automotive Engineer's recommendations help the Equipment Superintendent keep this fleet at peak performance.

25% MORE POWER ON QUARRY ENGINES



"I thought it might interest you to know what your Automotive Engineer, Mr. Custer, accomplished when you sent him up here," writes Mr. H. E. Pint of Pint's Soft Lime Products Company at Raymond, Iowa.

His letter continues: "Two of our 80 H.P., 6-cylinder engines were quite frequently unable to carry the load before Mr. Custer worked on them. Since he recommended changing air cleaners and carburetors and adjusted them with his instruments, I'd say our horsepower has been increased about 25%.

"On a check-up of gasoline consumption we find that in a ten hour run we use about a gallon an hour less.

"Thank you very much for this service."

"MUCH EASIER STARTING AT LOW TEMPERATURE" WRITES ROCKFORD FLEET OWNER

There's one man who is just as interested in your fleet operating problems as you are. He's not only concerned about the gasoline mileage you get or oil consumption; he's also thinking about maintenance costs and reliable operation. This man is the Standard Automotive Engineer in your locality.

Here's what usually happens when an operator lets this engineer help him "worry" about these fleet items. Greenlee Bros. & Co. of Rockford, Illinois, is a typical example and this is what Mr. F. M. Keig, Purchasing Agent of the company, reports:

"We want to take this opportunity to thank you for the engineering service given us by your Automotive Engineer, Mr. W. W. Cook, on our varied pieces of equipment.

"Since this service has been rendered, we have experienced much easier starting, especially at low temperature—far better all around performance—and an increase in miles per gallon; also our maintenance costs have been reduced considerably.

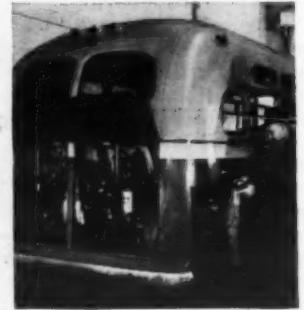
"Your engineering service and cooperation are greatly appreciated."

Ask a Standard Automotive Engineer what he does and what he thinks he can do for you to reduce operating costs.

A COMPLETE SERVICE FOR DIESEL BUS OPERATORS

If you operate Diesel buses, undoubtedly you have found out that your maintenance department has a lot of new problems to meet.

Standard Automotive Engineers are thoroughly familiar with the operation and maintenance of Diesels. Their suggestions may be of considerable help to your maintenance department. Standard Oil products for Diesels are available throughout the Middle West. Use these products. Take advantage of this Engineering Service and get the full economy of Diesel operation. You can reach your Automotive Engineer through any local Standard Oil (Ind.) office or by writing 910 South Michigan Avenue, Chicago, or Standard Oil Co. of Nebraska at Omaha.



STANDARD OIL COMPANY (INDIANA)
AUTOMOTIVE ENGINEERING SERVICE

LOWERS
MILEAGE
COSTS

Road-Mix Methods In Indiana County

(Continued from page 7)

operating the rotary-lift hydraulic lift for the trucks, and an Alemite pressure greasing outfit is also operated by air.

The Equipment Roster

The county is very well equipped for the type of work it undertakes, the major item being the dump trucks of which there are fifteen in the fleet as follows:

One 3-ton Mack truck
Two 1½-ton Mack trucks
Four 1½-ton International trucks
Two 1½-ton Chevrolet trucks
Three 1½-ton Dodge trucks
One 1½-ton Shubebaker truck
One 1½-ton Indiana truck
One 1½-ton Ford truck

In addition there is one 1½-ton Dodge stake body truck for the bridge crew and four 1½-ton Chevrolet pickup trucks. Added to this are the special trucks which comprise one Dodge truck with a Brooks Load Lugger, seven International trucks with Brooks Load Luggers, and one Ford with a 1,000-gallon water tank.

The other heavy construction equipment includes a 15-ton equipment trailer with a Fruehauf front end, an Acme 12-ton 3-wheel roller, a Galion 10-ton 3-wheel roller, an International 1-12 tractor with 6-foot mower bar, a Caterpillar Thirty-five tractor and a Caterpillar Thirty tractor, two Allis-Chalmers Model K tractors, three Adams power graders with 12-foot blades, one Adams pulled grader with an 8-foot blade, one Galion pulled grader with a 10-foot blade, two Galion pulled graders with 8-foot blades, and one Bradley multiple blade maintainer. The power graders are used for snow removal when needed, but as the snowfall is very light, and seldom reaches even 6 inches, they serve the purpose adequately.

The County also operates a rock quarry, with a crushing and screening plant capable of producing 300 tons per 8-hour day. Power for the plant is furnished by an International diesel engine, and WPA furnishes the labor.

Road-Mix Methods

Although road mix seems to be about the simplest form of road construction, we have noted in visiting well over a hundred of this type of project that there is practically infinite variety in methods, due in most cases to the different type of aggregate and sometimes the variable equipment, but this does not explain all of the variations. Vanderburgh County shows a slight variation from the usual procedure in its method of mixing gravels.

The road to be surfaced with road mix must have a minimum of 2 inches of gravel on a firm base. If this amount is not already on the road, the difference is made up with new screened gravel. Then the gravel is bladed to the two sides of the road onto the shoulders and the 18-foot width of road is primed with ½-gallon per square yard of an 80 per cent asphaltic road oil. The gravel is then pulled in from the sides, shaped up and shot with ½-gallon per square yard of cut-back asphalt MC3 for the full 18-foot width, and then mixed by the pulled graders or power graders by cutting one-half of the material to one side and the other half to the other side of the road and back to the center, repeating the operation until the mixing is complete. Then the material is spread as a uniform 2-inch layer across the road and rolled with a 10-ton 3-wheel roller.

This surface is then covered with 30 pounds per square yard of ¾ to ½-inch screen size gravel, spread by hand and broomed to a uniform layer and rolled. The final operation is shooting this surface with another ½-gallon per square yard of the cut-back asphalt, covering



C. & E. M. Photo
Cutting ditch with an Adams power grader on a Vanderburgh County, Ind., road.

it immediately with chips from ¼-inch to dust at the rate of 30 pounds per square yard, hand-cast and broomed, and then rolling to key in as much material as possible into the surface voids.

This type of road has been found to be very successful in Vanderburgh County, particularly as it closes the road to traffic for the minimum length of time. Traffic is allowed to use the road except during the first part of the rolling, and of course during the application of the asphalt, traffic is also excluded.

The Bridge Crew

This county has a total of 214 bridges varying from 8 feet to 300 feet in length. Of these, 115 are of steel, about half of which have concrete decks and the remainder wood decks. The balance of 99 bridges are built entirely of wood. In order to maintain these bridges in prime condition, the county has a regular crew of four men and twelve men furnished by WPA who operate over all the county, using a Dodge stake body truck for

the transportation of personnel and such equipment as jacks, bars, sledges, other needed tools and paint.

The bridge crew's equipment includes three painters' scaffolds, built of 4-inch heavy galvanized pipe, the end of each pipe telescoping into smaller pipe and fastened with safety bolts, so that the scaffold can be made any length desired. These "needle beams," as they are called, are swung on steel scaffolding hooks hanging from the eye bars of the bridge. These hooks are of different sizes and lengths to adjust the height of the scaffolds for bridge painting. These beams are decked with eight fir boards 2 ½ inches thick x 12 inches wide x 18 feet long with ½ x 2-inch iron straps at each end. In addition, there are four sets of blocks and tackles attached with 150 feet of ½-inch manila rope. These block and tackle sets are used for overhead bridges. Eight men clean the bridges and paint from one of these scaffolds.

Other repair equipment includes a portable drill with different sizes of drill

bits, one ratchet drill, one 20-ton; one 30-ton and four 75-ton hydraulic jacks as well as one 11-ton heavy-duty jack which is very useful. The bridge crew also has a Koehring 7-S Dandie mixer with an 18-gallon capacity siphon-type water-measuring tank.

This bridge crew has used 40,000 to 45,000 board-feet of 16 and 18-foot lengths of 3-inch white oak lumber for bridge decking during the past two years. This decking is treated on three sides, nailed to three stringers with 6-inch boat spikes, and the stringers are then bolted to the steel I-beams with 5/8 inch machine bolts. The deck is then covered with a topping 2 to 1 inch in thickness, with a strike-off board to form a crown to drain water off the bridge.

Personnel

The County Highway Department of Vanderburgh County is operated under the direction of the Board of County Commissioners, with William Koestring as County Highway Superintendent and J. W. Zimmer as Bridge Superintendent.

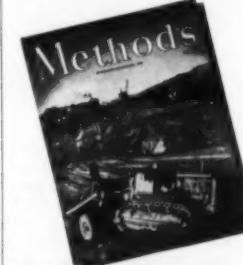
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C. & E. M. Photos

Ohio Route 7, north of Crown City, showing the high side-hill cut in rock which has been seeded to prevent erosion and to improve the appearance of the roadside. At the left is a close-up of the straw mulch, which had to be held down with binder twine, to protect the grass seed until it had germinated. See page 20.



C. & E. M. Photos

Through rough terrain, the new location of U. S. 3 in New Hampshire is carried by heavy fills of rock and earth. Below, a Sohramm air compressor is set up in scenic surroundings on John Iafolla's grading and surfacing contract near Woodstock, N. H., with Franconia Notch in the center of the horizon. See page 12.



C. & E. M. Photos

Recontouring an old but heavily traveled road in the Town of Franklin, Mass., and resurfacing it with road mix was completed successfully and economically last summer. Above is shown the first turn-over of $\frac{1}{4}$ -inch stone shot with Tarvia A, while at the right is the second mixing, showing a greater uniformity of aggregate and binder. About five round trips of the Adams grader were sufficient to mix the tar and aggregate thoroughly. See page 44.



C. & E. M. Photo

Oiled plywood with vertical 1-inch lagging was used by W. W. Wyman, Inc., for form lumber for the center pier of the new Black River Bridge, a 285.66-foot modern two-span plate girder structure with a 24-foot roadway, at Springfield, Vt. See page 29.



In November, the worst blizzard on record swept into Minnesota, doing considerable damage and taxing its snow-removal facilities. Because of the high wind, drifts were enormous, and in some places practically clogged highway underpasses, as shown at the left. At the right, one of the state's rotary plows is cutting its way through a 12-foot drift. See page 16.

